COVIDIEN

Service Manual

SurgiStat™

Low-Power Electrosurgical Generator

Service Manual

SurgiStat™
Low-Power Electrosurgical Generator

1079008

Preface

This manual and the equipment it describes are for use only by qualified medical professionals trained in the particular technique and surgical procedure to be performed. It is intended as a guide for using the Covidien SurgiStat™ Low-Power Electrosurgical Generator only. Additional technical information is available in the *SurgiStat™Low-Power Electrosurgical Generator User's Guide*.

This document covers technical descriptions of the SurgiStat electrosurgical generator, including its physical appearance, all operator controls and indications, operational specifications, component functional descriptions (module level), diagrams of the electronic circuits used, and troubleshooting guidelines (with chart comparisons).

The SurgiStat generator was constructed with the highest quality components and was built in an ISO 9000 registered environment. In the unlikely event that your generator fails within one year of purchase date, Covidien will warranty the product and effect factory repairs. Please refer to the *Limited Warranty*, for what is covered and how long. For information on how to obtain a Return Authorization Number, refer to *Step 1 – Obtain a Return Authorization Number* on page 8-2.

Equipment covered in this manual

SurgiStat™ Low-Power Electrosurgical Generator (VLSURGGEN)

Safety Precautions When Operating the Generator

The safe and effective use of electrosurgery depends to a large degree on factors solely under the control of the operator. There is no substitute for a properly trained and vigilant medical staff. It is important that they read, understand, and follow the operating instructions supplied with this electrosurgical equipment.

To promote the safe use of the SurgiStat electrosurgical generator, please refer to the *SurgiStat Low-Power Electrosurgical Generator User's Guide* for standard operating precautions.

Conventions Used in this Guide

Warning

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Precaution

Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

Notice

Indicates a hazard that may result in product damage.

Important

Indicates an operating tip or maintenance suggestion.

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SurgiStat™ Low-Power Electrosurgical Generator	One year from date of shipping

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Chapter 1

Introduction

This section includes the following information:

- Functional Description
- Generator Description
- Safety

Precaution
Read all warnings, cautions, and instructions provided with this generator before using.
Read the instructions, warnings, and cautions provided with electrosurgical accessories before using. Specific instructions are not included in this manual.

Functional Description

The SurgiStat Low-Power Electrosurgical Generator is a multipurpose electrosurgical generator for use in physician's offices and surgi-centers. It provides unsurpassed performance, flexibility, reliability, and user convenience in one compact package.

The SurgiStat includes digital technology. This new technology is evident in the self-checking circuitry and error code readouts. The generator offers monopolar and bipolar electrosurgical operations.

The following are SurgiStat key advantages and benefits.

Power Capabilities	Up to 120 watts (W) of Pure Cut @ 500 ohms (Ω). Up to 90 W of Blend @ 800 Ω. Up to 80 W of Desiccation @ 1000 Ω. Up to 40 W of Fulguration @ 1000 Ω. Up to 30 W of Bipolar @ 200 Ω.
Two Levels of Coagulation: Desiccation and Fulguration	Desiccation provides precise control of bleeding in localized areas. Fulguration provides greater control of bleeding in highly vascular tissue over broader tissue surface areas.
Return Electrode Monitoring System	The generator incorporates a return electrode contact quality monitoring system (Bovie NEM™*). This system determines the type of patient return electrode attached (single-plate or split-plate). It also continuously monitors the contact impedance between the patient and the split-plate patient return electrode. Contact impedance is monitored only when approved split-plate patient return electrodes are used.
Memory	The generator powers up to the last selected modes and their last selected power settings.
Isolated (Floating) Radio Frequency (RF) Output	This minimizes the potential of alternate-site burns.
Standard Front Panel Connectors	These connectors accept the latest monopolar and bipolar instruments.
Self Diagnostics	These diagnostics continually monitor the generator to ensure proper performance. Whenever they detect a problem, medical personnel receive audible and visual alarm responses, and the output is suspended until the alarm condition is cleared.

Generator Description

The SurgiStat Low-Power Electrosurgical Generator is a self-contained generator, consisting of the main enclosure and power cord. The main components incorporated in the generator are:

- **Front Panel Components** – Power switch, two dials for controlling power output, membrane switches for selecting modes, receptacles for connecting electrosurgical accessories, and indicators that show the current settings and patient return electrode status.
- **Rear Panel Components** – Volume control, footswitch receptacle, power cable receptacle and fuse holder, and equipotential grounding lug.
- **Internal Components** – Display board, main board, pad sensing module, speaker board, and relay board.

Safety Precautions When Testing the Generator

Before testing this generator it is important that you read, understand, and follow the instructions supplied with it. Also, be familiar with any other equipment used to install and test the generator.

General Warnings, Cautions, and Notices

Warning

Use the generator only if the self-test has been completed as described. Otherwise, inaccurate power outputs may result.

The instrument receptacles on this generator are designed to accept only one instrument at a time. Do not attempt to connect more than one instrument at a time into a given receptacle. Doing so will cause simultaneous activation of the instruments.

To reduce the potential for alternate site burns, do one or more of the following:

- Avoid skin-to-skin contact points, such as fingers touching leg, when positioning the patient.
- Place 5 to 8 cm (2 to 3 in.) of dry gauze between contact points to ensure that contact does not occur.
- Position the patient return electrode to provide a direct current route between the surgical site and the return electrode which avoids skin-to-skin contact areas.
- In addition, place patient return electrodes according to the manufacturer's instructions.Potential for alternate site burns increases if the return electrode is compromised. Covidien recommends the use of split patient return electrodes with a contact quality monitoring system.

Warning

Do not wrap the accessory cords or patient return electrode cords around metal objects. This may induce currents that could lead to shocks, fires, or injury to the patient or surgical team.

Failure of the high-frequency surgical equipment could result in an unintended increase of output power.

Use the lowest output setting necessary to achieve the desired surgical effect. Use the active electrode only for the minimum time necessary in order to lessen the possibility of unintended burn injury. Pediatric applications and/or procedures performed on small anatomic structures may require reduced power settings. The higher the current flow, and the longer the current is applied, the greater the possibility of unintended thermal damage to tissue, especially during use on small structures.

Avoid using power settings that would exceed the highest maximum voltage that is acceptable for each accessory. Choose only accessories that will withstand each mode and power setting.

Use electrosurgery with caution in the presence of internal or external devices such as pacemakers or pulse generators. Interference produced by the use of electrosurgical devices can cause devices such as pacemakers to enter an asynchronous mode or can block the pacemaker effect entirely. Consult the device manufacturer or hospital Cardiology Department for further information when use of electrosurgical appliances is planned for patients with cardiac pacemakers or other implantable devices.

In some circumstances, potential exists for alternate site burns at points of skin contact (e.g., between the arm and the side of the body). This occurs when electrosurgical current seeks a path to the patient return electrode that includes the skin-to-skin contact point.

Current passing through small skin-to-skin contact points is concentrated and may cause a burn. This is true for grounded, ground referenced, and isolated output generators.

Precaution

Do not stack equipment on top of the generator or place the generator on top of electrical equipment. These configurations are unstable and/or do not allow adequate cooling.

Provide as much distance as possible between the electrosurgical generator and other electronic equipment (such as monitors). An activated electrosurgical generator may cause electrical interference with them.

Do not turn the activation tone down to an inaudible level. The activation tone alerts the surgical team when an accessory is active.

At no time should you touch the active electrode or bipolar forceps. A burn could result.

Non-function of the generator may cause interruption of surgery. A backup generator should be available for use.

When using a smoke evacuator in conjunction with the electrosurgical generator, place the smoke evacuator a distance from the generator and set the generator volume control at a level that ensures that the activation tones can be heard.

Precaution
When high-frequency surgical equipment and physiological monitoring equipment are used simultaneously on the same patient, place any monitoring electrodes as far as possible from the surgical electrodes.
Do not use needles as monitoring electrodes during electrosurgical procedures. Inadvertent electrosurgical burns may result.
To avoid the possibility of an electrosurgical burn to either the patient or the physicians, do not allow the patient to come in contact with a grounded metal object during activation. When activating the unit, do not allow direct skin contact between the patient and the physician.
To avoid the possibility of a burn to the patient, when using a split pad do not activate the unit if the solid pad indicator is illuminated green or the red alarm indicator remains illuminated red. This could indicate improper pad placement or a faulty NEM circuit.
Remove any loose fitting jewelry from the patient before activation.
Examine all accessories and connections to the electrosurgical generator before use. Ensure that the accessories function as intended. Improper connection may result in arcs, sparks, accessory malfunction, or unintended surgical effects.
When not using active accessories, place them in a holster or in a clean, dry, nonconductive, and highly visible area not in contact with the patient. Inadvertent contact with the patient may result in burns.
Studies have shown that smoke generated during electrosurgical procedures can be potentially harmful to patients and the surgical team. These studies recommend adequately ventilating the smoke by using a surgical smoke evacuator or other means.[1]

1. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health (NIOSH). Control of Smoke from Laser/Electric Surgical Procedures. HAZARD CONTROLS, Publication No. 96-128, September, 1996.

Notice
If required by local codes, connect the generator to the hospital equalization (grounding) connector with an equipotential cable.
Connect the power cord to a wall receptacle having the correct voltage. Otherwise, product damage may result.

Active Accessories

Warning
Electric Shock Hazard Do not connect wet accessories to the generator.
Electric Shock Hazard Ensure that all accessories and adapters are correctly connected and that no metal is exposed.

Precaution

Accessories must be connected to the proper receptacle type. In particular, bipolar accessories must be connected only to the bipolar instrument receptacle. Improper connection may result in inadvertent generator activation or a contact quality monitor alarm.

Set power levels to the lowest setting before testing an accessory.

Notice

During bipolar electrosurgery, do not activate the generator until the forceps have made contact with the patient. Product damage may occur.

Fire/Explosion Hazards

Warning

Explosion Hazard Do not use the generator in the presence of flammable anesthetics, gases, liquids, or objects.

Fire Hazard Do not place active accessories near or in contact with flammable materials (such as gauze or surgical drapes). Electrosurgical accessories that are activated or hot from use can cause a fire. Use a holster to hold electrosurgical accessories safely away from personnel and flammable materials.

Fire/Explosion Hazard—The following substances will contribute to increased fire and explosion hazards in the operating room:

- Flammable substances (such as alcohol based skin prepping agents and tinctures)
- Naturally occurring flammable gases which may accumulate in body cavities such as the bowel
- Oxygen-enriched atmospheres
- Oxidizing agents (such as nitrous oxide [N_20] atmospheres).

The sparking and heating associated with electrosurgery can provide an ignition source. Observe fire precautions at all times. When using electrosurgery in the same room with any of these substances or gases, prevent their accumulation or pooling under surgical drapes, or within the area where electrosurgery is performed.

The use of flammable anesthetics or oxidizing gases such as nitrous oxide (N_2O) and oxygen should be avoided if a surgical procedure is carried out in the region of the thorax or the head, unless these agents are evacuated.

Non-flammable agents should be used for cleaning and disinfection wherever possible.

Warning

Flammable agents used for cleaning or disinfecting, or as solvents of adhesives, should be allowed to evaporate before the application of high-frequency surgery. There is a risk of pooling flammable solutions under the patient or in body depressions such as the umbilicus, and in body cavities such as the vagina. Any fluids pooled in these areas should be mopped up before high-frequency surgical equipment is used. Attention should be called to the danger of ignition of endogenous gases.Some materials, for example—cotton, wool and gauze—when saturated with oxygen may be ignited by sparks produced in normal use of the high-frequency surgical equipment.

No modification of this equipment is allowed.

Electric Shock Hazard—Connect the power cord to a properly polarized and grounded power source with the frequency and voltage characteristics that match those listed on the back of the unit. Do not use power plug adapters.

To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.

Electric Shock Hazard—Always turn off and unplug the generator before cleaning.

Fire Hazard Do not use extension cords.

Fire Hazard For continued protection against fire hazard, replace fuses only with fuses of the same type and rating as the original fuse.

Generator Electric Shock Hazards

Warning

Do not remove any covers or panels exposing the internal components. Refer to a Covidien representative for service.

Connect the generator power cord to a properly grounded receptacle. Do not use power plug adapters.

Electric Shock Hazard—Connect the power cord to a properly polarized and grounded power source with the frequency and voltage characteristics that match those listed on the back of the unit. Do not use power plug adapters.

Do not connect a wet power cord to the generator or to the wall receptacle.

To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.

To allow stored energy to dissipate after power is disconnected (caps discharge) wait at least five minutes before replacing parts.

Always turn off and unplug the generator before cleaning.

Do not touch any exposed wiring or conductive surfaces while the generator is disassembled and energized. Never wear a grounding strap when working on an energized generator.

Warning

When taking troubleshooting measurements use appropriate precautions, such as using isolated tools and equipment, using the "one hand rule," etc.

Potentially lethal AC and DC voltages are present in the AC line circuitry, high voltage DC circuitry, and associated mounting and heat sink hardware described in this manual. These potentials are not isolated from the AC line. Take appropriate precautions when testing and troubleshooting this area of the generator.

High-frequency, high-voltage signals that can cause severe burns are present in the RF output stage and in the associated mounting and heat sink hardware. Take appropriate precautions when testing and troubleshooting this area of the generator.

Hazardous Electrical Output —This equipment is for use only by trained, licensed physicians.

Servicing

Warning

No modification of this equipment is allowed.

Precaution

Read all warnings, precautions, and instructions provided with this generator before testing.

Notice

There are no internal user serviceable parts. For repairs, return the generator to Covidien.

The generator contains electrostatic-sensitive components. When repairing the generator, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized generator. Handle circuit boards by their nonconductive edges. Use an anti-static container for transport of electrostatic-sensitive components and circuit boards

Provide as much distance as possible between the electrosurgical generator and other electronic equipment (such as monitors). An activated electrosurgical generator may cause interference with them.

After installing a new low voltage power supply, verify that the voltages are correct.

Cleaning

Notice

Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

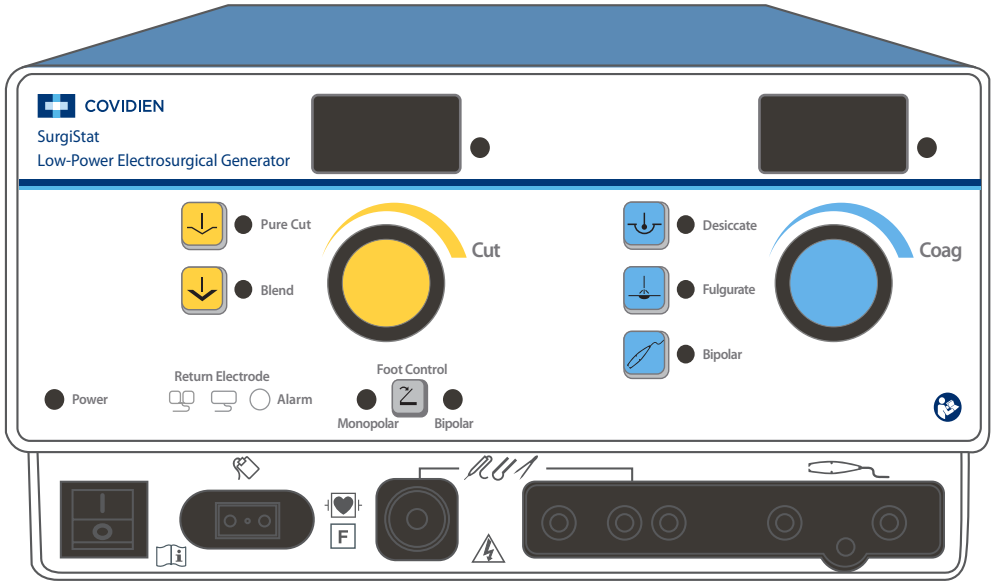
Chapter 2

Controls, Indicators, and Receptacles

This section describes the front and rear panels, including all controls, indicators, receptacles, the fuse drawer, and ports.

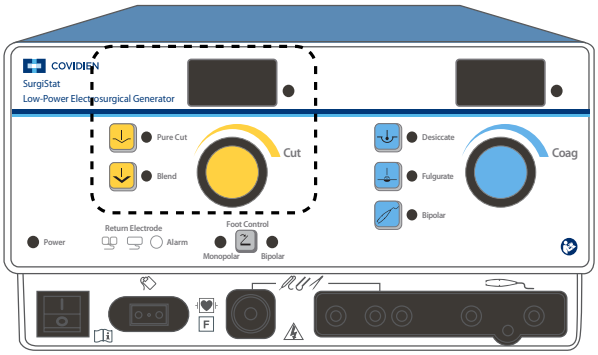
Front Panel

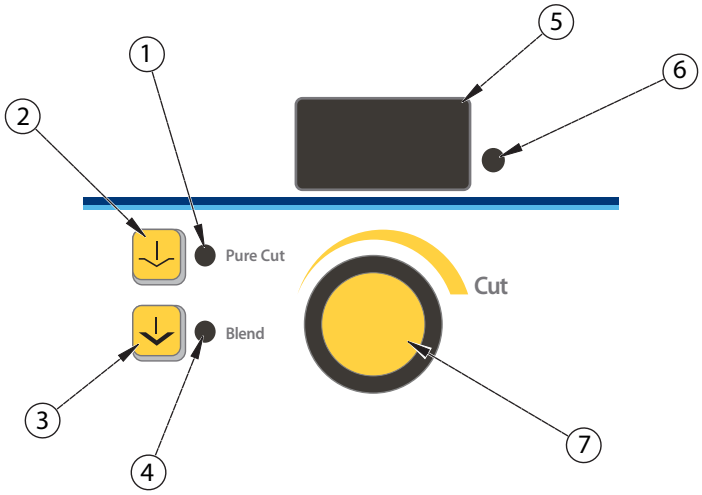
Layout of controls, indicators, and receptacles on the front panel



Cut and Blend Controls

Controls for the Cut and Blend modes





① Cut Indicator

Illuminates when Pure Cut mode is selected.

② Cut Selector

When pressed, selects the Pure Cut mode.

③ Blend Selector

When pressed, selects the Blend mode.

④ Blend Indicator

Illuminates when Blend mode is selected.

⑤ Cut and Blend Power Display (watts)

Indicates the power set for the Pure Cut or Blend mode.

⑥ Cut and Blend Activation Indicator

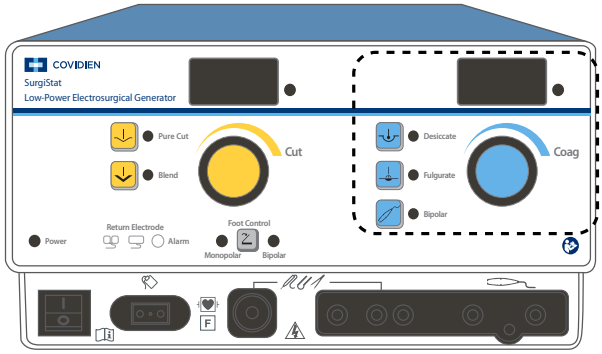
Illuminates when either Pure Cut or Blend mode is activated.

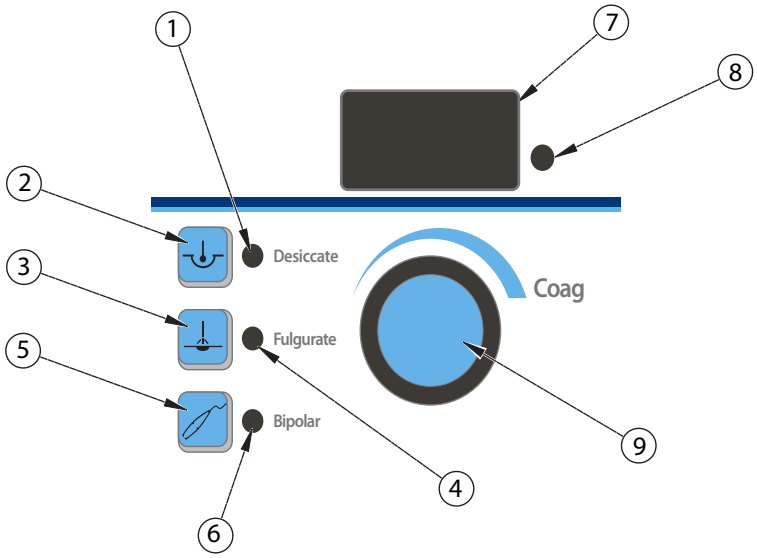
⑦ Cut and Blend Power Control Dial

Increases or decreases the Cut or Blend power output in increments of one watt.

Coag and Bipolar Controls

Controls for the Desiccate, Fulgurate, and Bipolar modes





① Desiccate Indicator

Illuminates when Desiccate mode is selected.

② Desiccate Selector

When pressed, selects the Desiccate mode.

③ Fulgurate Indicator

Illuminates when Fulgurate mode is selected.

④ Fulgurate Selector

When pressed, selects the Fulgurate mode.

⑤ Bipolar Selector

When pressed, selects the Bipolar mode.

⑥ Bipolar Indicator

Illuminates when Bipolar mode is selected.

⑦ Coag and Bipolar Power Display (watts)

Indicates the power set for any Coag or Bipolar mode.

⑧ Coag and Bipolar Activation Indicator

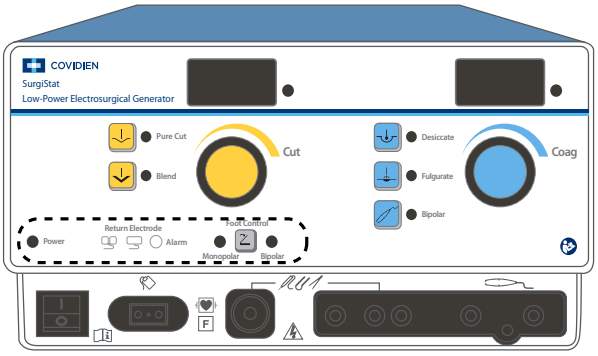
Illuminates when Desiccate, Fulgurate, or Bipolar modes are activated.

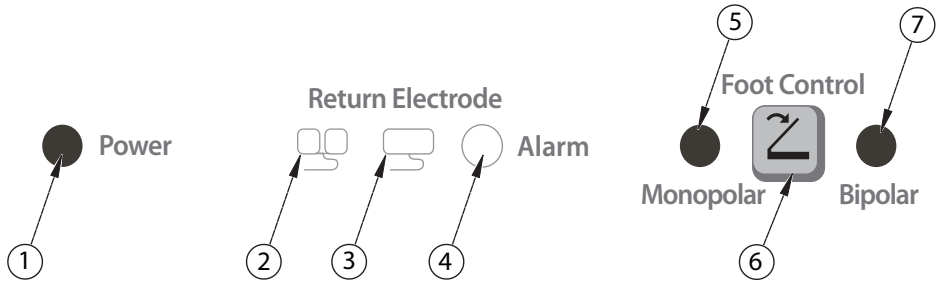
⑨ Coag and Bipolar Power Control Dial

Increases or decreases the Coag or Bipolar power output in increments of one watt.

Indicators

Indicators for power, return electrodes, and footswitch control





① Power Indicator

Illuminates when the unit is on.

② Split-Plate Patient Return Electrode Indicator

Illuminates when the system detects a split-plate.

③ Single-Plate Patient Return Electrode Indicator

Illuminates when the system detects a single-plate.

④ Patient Return Electrode Alarm Indicator

Illuminates when the system detects a patient return electrode alarm condition.

⑤ Monopolar Footswitch Control Indicator

Illuminates when monopolar foot control is selected.

⑥ Footswitch Control Selector

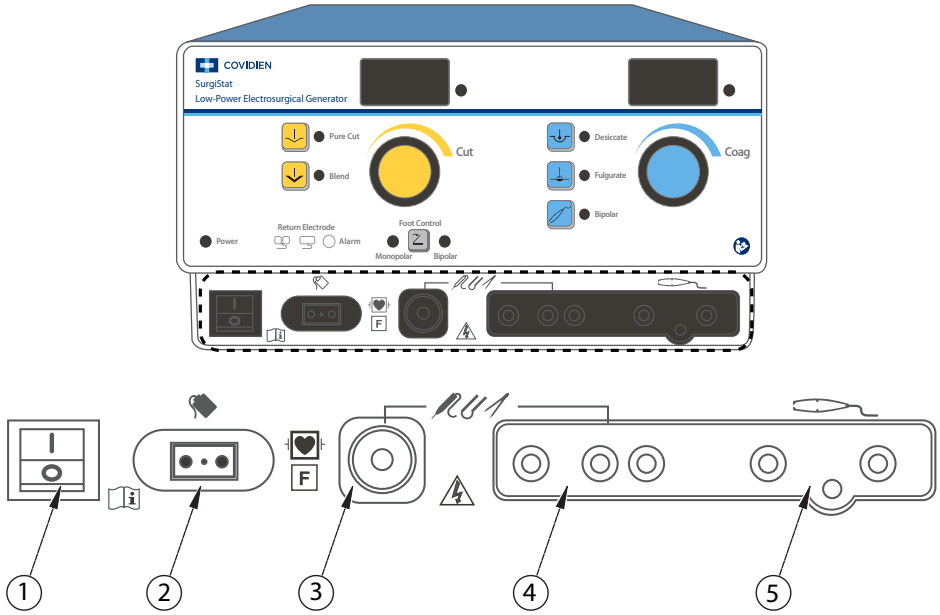
When pressed, toggles between monopolar and bipolar foot control.

⑦ Bipolar Footswitch Control Indicator

Illuminates when bipolar foot control is selected.

Power Switch and Receptacles

Location of the unit power switch and front panel receptacles



① Power On/Off Switch

Turns the unit on or off.

② Patient Return Electrode Receptacle

Accepts a standard patient return electrode plug.

③ Monopolar Footswitching Receptacle

Accepts cables or adapters equipped with standard (Bovie™* #12) active plugs. Connect footswitching accessories.

④ Monopolar Handswitching Receptacle

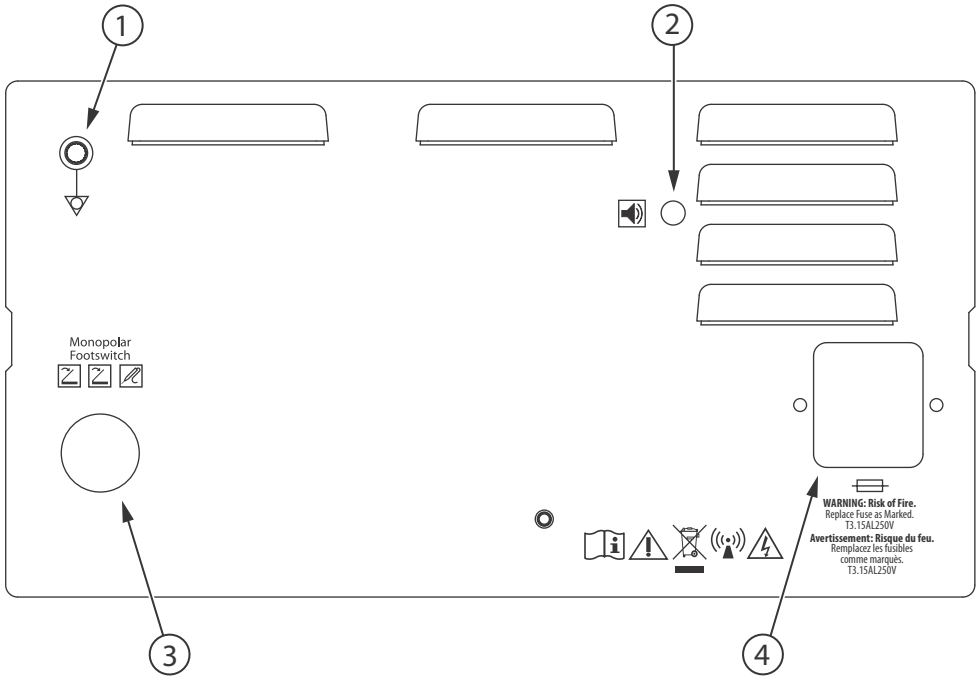
Accepts standard three-pin handpieces. Connect handswitching accessories.

⑤ Bipolar Receptacle

Accepts standard cables for Bipolar handpieces.

Rear Panel

Layout of connectors and controls on the rear panel



① Equipotential Connector

Allows attaching a standard grounding cable to chassis ground for additional protection against leakage current.

② Volume Control

Controls the volume of the audible tones produced during normal unit activation. To increase volume, rotate the knob clockwise.

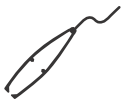
③ Footswitch Receptacle

Accepts the E6008 or E6008B monopolar footswitch. Use the monopolar footswitch for both monopolar and bipolar activation. Use only a Covidien monopolar footswitch with the SurgiStat Low-Power Electrosurgical Generator. Use of an incompatible footswitch may cause unexpected output.

④ Power Cable Receptacle and Fuse Holder

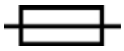
Connects a hospital grade power cord to supply AC mains power to the unit.

Symbols on the Front Panel

Symbols	Description
Cut Controls	
	Pure cut mode
	Blend mode
Coag Controls	
	Desiccate mode
	Fulgurate mode
	Bipolar mode
Indicators	
	Split-plate patient return electrode
	Single-plate patient return electrode
	Footswitch (on the selector button)
Power Switch, Handpiece Connectors, and Symbols	
	Follow instructions for use (blue)

Symbols	Description
	Consult instructions for use
	Patient return electrode
	Type CF equipment
	RF isolated – patient connections are isolated from earth at high frequency
	Monopolar output
	Caution – high voltage
	Bipolar output

Symbols on the Rear Panel

Symbols	Description
	Equipotential ground stud
	Volume control
	Monopolar footswitch
	Consult instructions for use
	Read instructions before use
	WEEE (Waste from electrical and electronic equipment)
	Nonionizing radiation
	Fuse
	Danger Explosion risk if used with flammable anesthetics
	Testing agency's certification mark for compliance to electrical safety and electromagnetic-compatibility standards
	CE Marking indicating conformity to product requirements of the European Union

Chapter 3

Technical Specifications

All specifications are nominal and subject to change without notice. A specification referred to as “typical” is within ± 20% of a stated value at room temperature (77 °F / 25 °C) and a nominal input power voltage.

Performance Characteristics

Input Power

100–240 Volt
Mains line frequency range (nominal): 50–60 Hz
Power consumption: 3 A
Fuses (2): 3.15 A (Slow Blow)

Duty Cycle

Under maximum power settings and rated load conditions (Pure Cut, 120 watt @ 500 Ω load), the generator is suitable for activation times of 10 seconds on, 30 seconds off for one hour.

Dimensions and Weight

Width	10.25" (26 cm)
Depth	12" (30.5 cm)
Height	6" (15.2 cm)
Weight	< 9 lb. (< 4 kg)

Operating Parameters

Ambient temperature range	50 to 104 °F (10 to 40 °C)
Relative humidity	30% to 75%, non-condensing
Atmospheric pressure	70 kPa to 106 kPa
Warm-up time	If transported or stored at temperatures outside the operating temperature range, allow one hour for the generator to reach room temperature before use.

Transport

Ambient temperature range	-40 to 158 °F (-40° to 70 °C)
Relative humidity	10% to 100%, including condensation
Atmospheric pressure	50 kPa to 106 kPa

Storage

Ambient temperature range	-68 to 86 °F (10° to 30 °C)
Relative humidity	10% to 75%, noncondensing
Atmospheric pressure	50 kPa to 106 kPa

Audio Volume

The audio levels stated below are for activation tones (Bipolar, Cut, and Coag) and alarm tones (return electrode and system alarms) at a distance of one meter. Alarm tones meet the requirements for IEC 60601-2-2.

Activation Tone

Volume (adjustable)	40 to 65 dB
Frequency	Cut: 610 Hz Blend: 610 Hz Desiccation: 910 Hz Fulguration: 910 Hz Bipolar: 910 Hz
Duration	Continuous while the generator is activated

Alarm Tone

Volume (not adjustable)	70 dB ± 5 dB
Frequency	2 kHz for 0.5 second, then 1 kHz for 0.5 second
Duration	2 seconds

Patient Return Electrode Sensing

The system presents audible and visible alarms when it senses no return electrode.

Single-Plate	Set resistance: 0 Ω to 5 Ω ± 3 Ω Continuous measurement: Once the system establishes the single-plate electrode resistance, an increase of 20 Ω ± 5 Ω in resistance will cause an alarm. When the alarm condition exists, the system deactivates output power.

Split-Plate	Set resistance: 10 Ω ± 5 Ω to 135 Ω ± 10 Ω Continuous measurement: Once the system establishes the split-plate electrode resistance, an increase of 40% in resistance will cause an alarm. When the alarm condition exists, the system deactivates output power.

The system presents audible and visible alarms when it does not sense a patient return electrode.

- When a fault condition occurs, the alarm indicator flashes red, an alarm tone sounds, and the system disables output power.
- The red LED alarm indicator remains illuminated until the condition that caused the alarm is corrected.
- Activation attempts during an alarm condition result in an audio alarm and the alarm indicator flashes.
- When the alarm condition is resolved, the green single or split-plate indicator will illuminate.
- The system measures the return electrode sensing current according to IEC 60601-1.

Low Frequency (50–60 Hz) Leakage Current

Enclosure source current, ground open	< 300 µA
Source current, patient leads, all outputs	Normal polarity, intact ground: < 10 µA Normal polarity, ground open: < 50 µA Reverse polarity, ground open: < 50 µA
Sink current at high line, all inputs	< 20 µA

High Frequency (RF) Leakage Current

Bipolar RF leakage current	< 39 mA_{rms}
Monopolar RF leakage current (additional tolerance)	< 150 mA_{rms}

Operating Conditions

RF energy is generated and passed through an interconnecting cable to an accessory where the energy is delivered to cut, coagulate, and ablate tissue.

Standards and IEC Classifications

The SurgiStat Low-Power Electrosurgical Generator meets all pertinent clauses of the IEC 60601-1 and IEC 60601-2-2.

Class I Equipment (IEC 60601-1)

Accessible conductive parts cannot become live in the event of a basic insulation failure because of the way in which they are connected to the protective earth conductor.

Type CF Equipment (IEC 60601-1)/Defibrillator Proof

The SurgiStat Low-Power Electrosurgical Generator provides a high degree of protection against electric shock, particularly regarding allowable leakage currents. It is type CF isolated (floating) output and may be used for procedures involving the heart.

Drip Proof (IEC 60601-2-2)

The SurgiStat Low-Power Electrosurgical Generator enclosure is constructed so that liquid spillage in normal use does not wet electrical insulation or other components which, when wet, are likely to adversely affect the safety of the generator.

Electromagnetic Interference

When placed on or beneath an activated Covidien electrosurgical generator, the SurgiStat Low-Power Electrosurgical Generator can be activated without interference. The generator minimizes electromagnetic interference to video equipment used in the operating room.

Voltage Transients (Emergency Generator Mains Transfer)

The SurgiStat Low-Power Electrosurgical Generator operates in a safe manner when the transfer is made between line AC and an emergency generator voltage source.

Electromagnetic Compatibility (IEC 60601-1-2 and IEC 60601-2-2)

The SurgiStat Low-Power Electrosurgical Generator complies with the appropriate IEC 60601-1-2 and IEC 60601-2-2 specifications regarding electromagnetic compatibility.

Notice

The SurgiStat Low-Power Electrosurgical Generator requires special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the *SurgiStat Low-Power Electrosurgical Generator Service Manual*.

Portable and mobile RF communications equipment can affect the SurgiStat Low-Power Electrosurgical Generator. Refer to the EMC information provided in the *SurgiStat Low-Power Electrosurgical Generator Service Manual*.

EMC Compliance

Special precautions should be taken regarding the generator. Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in this manual.

Understand that only the accessories supplied with, or ordered from Covidien should be used with your device. The use of accessories, transducers, and cables other than those specified, may result in increased emissions or decreased Immunity of the SurgiStat generator. The generator and its accessories are not suitable for interconnection with other equipment.

Portable and mobile RF communications equipment can affect medical electrical equipment. The SurgiStat should not be used adjacent to or stacked with other equipment and use adjacent to other devices or stacked with other equipment, the SurgiStat generator should be observed to verify normal operation in the configuration in which it will be used.

Recommended separation distances between portable and mobile RF communications equipment and the SurgiStat Low-Power Electrosurgical Generator.

The SurgiStat is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the SurgiStat can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the SurgiStat as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	separation distance according to frequency of transmitter in metres (m)		
	150 kHz to 80 MHz $d=\left[\frac{3.5}{V_1}\right]\sqrt{P}$	80 MHz to 800 MHz $d=\left[\frac{3.5}{E_1}\right]\sqrt{P}$	800 MHz to 2.5 GHz $d=\left[\frac{7}{E_1}\right]\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Guidance and manufacturer's declaration – electromagnetic emissions		
The SurgiStat Low-Power Electrosurgical Generator is intended for use in the electromagnetic environment listed below. The customer or the user of the SurgiStat Generator should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF Emissions CISPR 11	Group 2	The SurgiStat must emit electromagnetic energy in order to perform its intended function.Nearby electronic equipment maybe affected.
RF Emissions CISPR 11	Class A	The SurgiStat is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used in domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration – electromagnetic immunity			
The SurgiStat is intended for use in the electromagnetic environment listed below. The customer or the user of the SurgiStat should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines	±2 kV for power supply lines ±1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.

Guidance and manufacturer's declaration – electromagnetic immunity			
Voltage dips, short interruptions and voltage variations on power supply input lines EC 61000-4-11	<5% U_t (>95% dip in U_t) for 0.5 cycle 40% U_t (60% dip in U_t) for 5 cycles 70%U_t (30% dip in U_t) for 25 cycles <5% U_t (>95% dip in U_t) for 5 sec.	<5% U_t (>95% dip in U_t) for 0.5 cycle 40% U_t (60% dip in U_t) for 5 cycles 70%U_t (30% dip in U_t) for 25 cycles <5% U_t (>95% dip in U_t) for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment. If the user of the SurgiStat requires continued operation during power mains interruptions, it is recommended that the SurgiStat be powered from an uninterruptible power supply ora battery.
Power frequency (50/60Hz) magnetic field IEC 61000-4-8	3A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: U_t is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity (continued)			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC 61000-4-6	3 V_{rms} 150 kHz to 80 MHz	3 V_{rms} (V_1)	Portable and mobile RF communications equipment should be used no closer to any part of the SurgiStat, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d=\left[\frac{3.5}{3}\right]\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 kHz to 2.5 GHz	3 V/m (E_1)	$d=\left[\frac{3.5}{3}\right]\sqrt{P}$ 80 MHz to 800 MHz $d=\left[\frac{7}{3}\right]\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m) Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol.

Guidance and manufacturer's declaration – electromagnetic immunity (continued)
NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.
[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicated theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location which the SurgiStat is used exceeds the applicable RF compliance level above, the SurgiStat should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the SurgiStat. [b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [V_3] V/m.

Output Characteristics

Maximum Output for Bipolar and Monopolar Modes

Power readouts agree with actual power into rated load to within 20% or 5 W, whichever is greater.

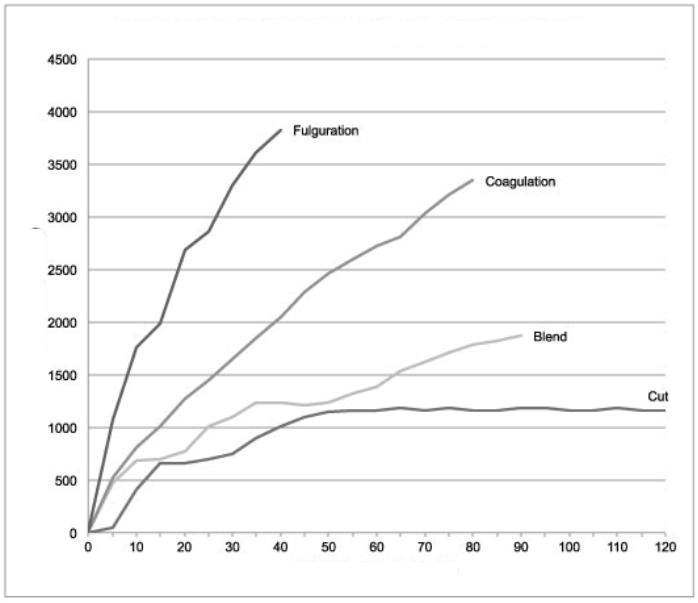
Mode	Output Power	Output Frequency	Repetition Rate	Open Circuit Vpeak max	Crest Factor* (Rated Load)
Cut	120 W @ 500 Ω	357 kHz ± 50 kHz	None	1250 V	2.9 ± 20%
Blend	90 W @ 800 Ω	357 kHz ± 50 kHz	30 kHz ± 5 kHz	1850 V	3.3 ± 20%
Desiccate	80 W @ 1000 Ω	475 kHz ± 19 kHz	57 kHz ± 5 kHz	3300 V	5.5 ± 20%
Fulgurate	40 W @ 1000 Ω	410 kHz ± 50 kHz	25 kHz ± 5 kHz	3900 V	7.7 ± 20%
Bipolar	30 W @ 200 Ω	520 kHz (-14 kHz, +29 kHz)	32 kHz ± 5 kHz	1200 V	6.9 ± 20%

** An indication of a waveform's ability to coagulate bleeders without a cutting effect*

Output Power Curves

The curves that follow depict the changes for each mode at specific power settings. All measurements were taken at the nominal input power voltage used for calibration.

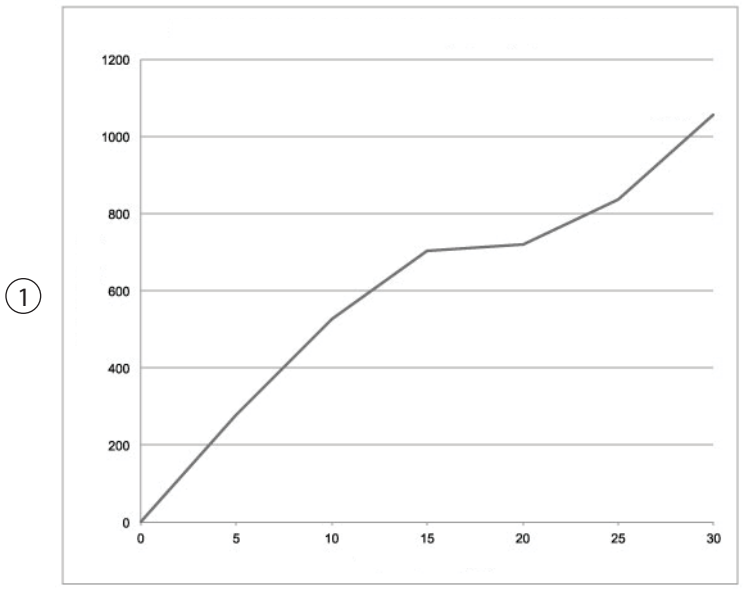
Output voltage (Vpeak) vs. power setting (Cut, Coag)



① Voltage (Vpeak)

② Power Setting (watts)

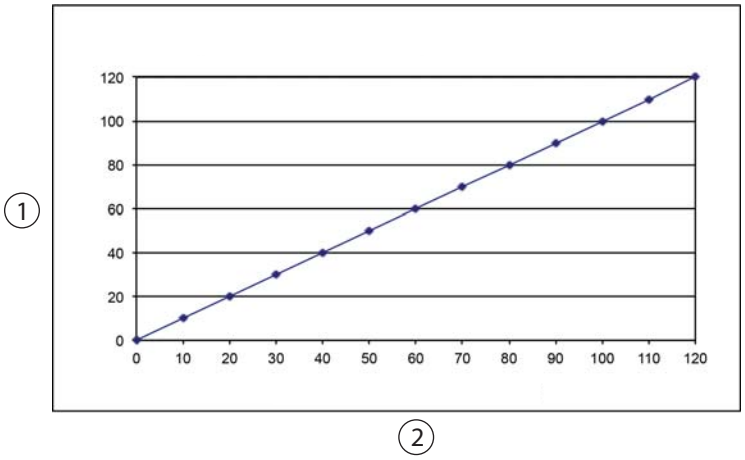
Output voltage (Vpeak) vs. power setting (Bipolar)



① Voltage (Vpeak)

② Power Setting (watts)

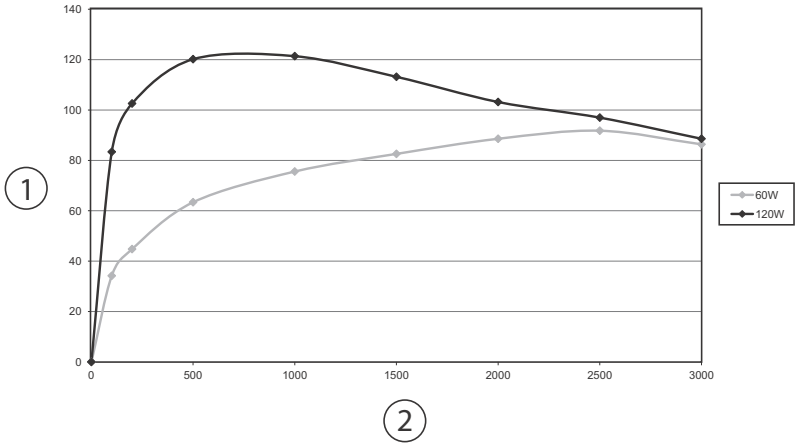
Output power vs. power settings for all modes



① Output Power (watts)

② Power Setting % of Total Power

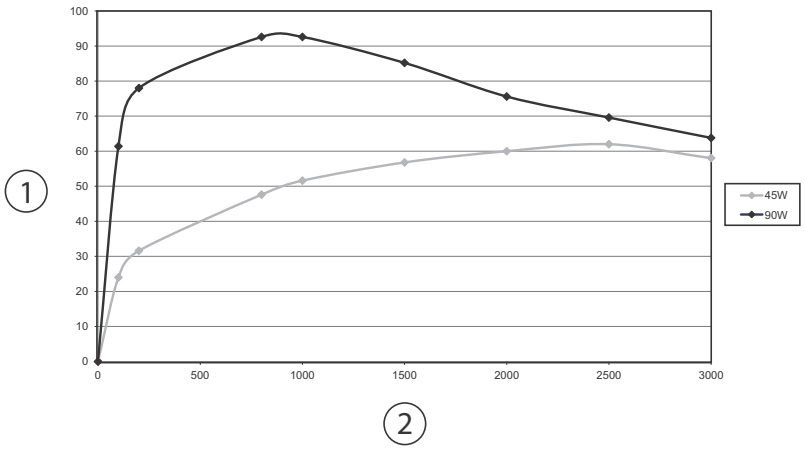
Output power vs. impedance for Cut mode



① Output Power (watts)

② Load Resistance (ohms)

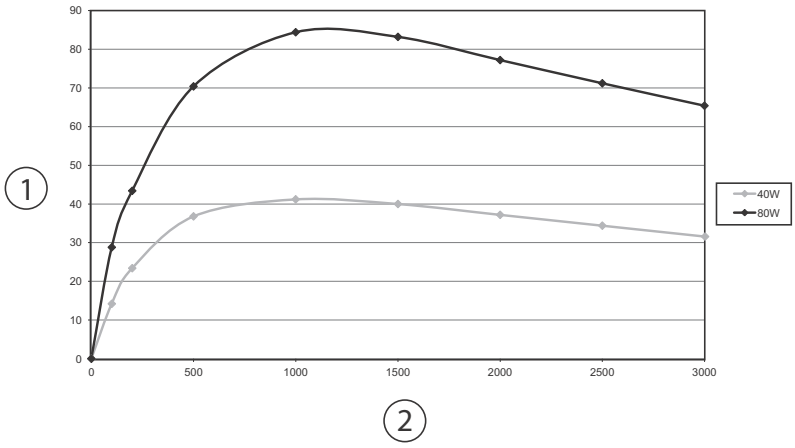
Output power vs. impedance for Blend mode



① Output Power (watts)

② Load Resistance (ohms)

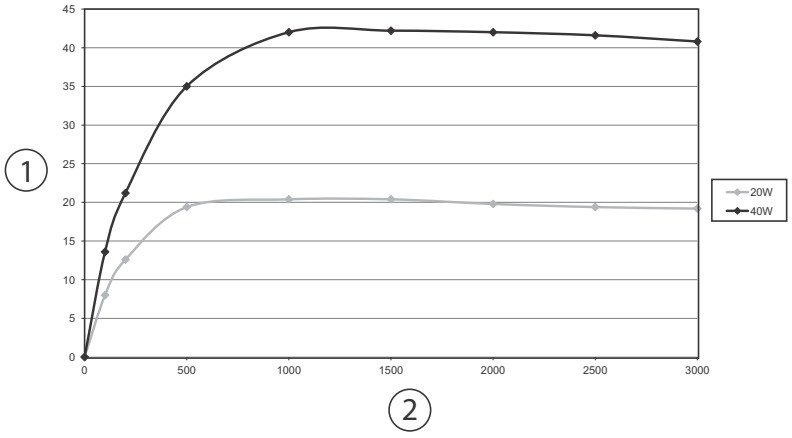
Output power vs. impedance for Desiccate mode



① Output Power (watts)

② Load Resistance (ohms)

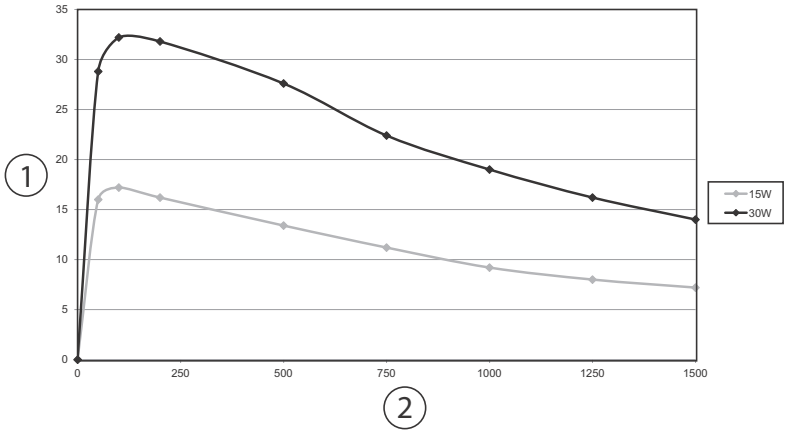
Output power vs. impedance for Fulgurate mode



① Output Power (watts)

② Load Resistance (ohms)

Output power vs. impedance for Bipolar mode



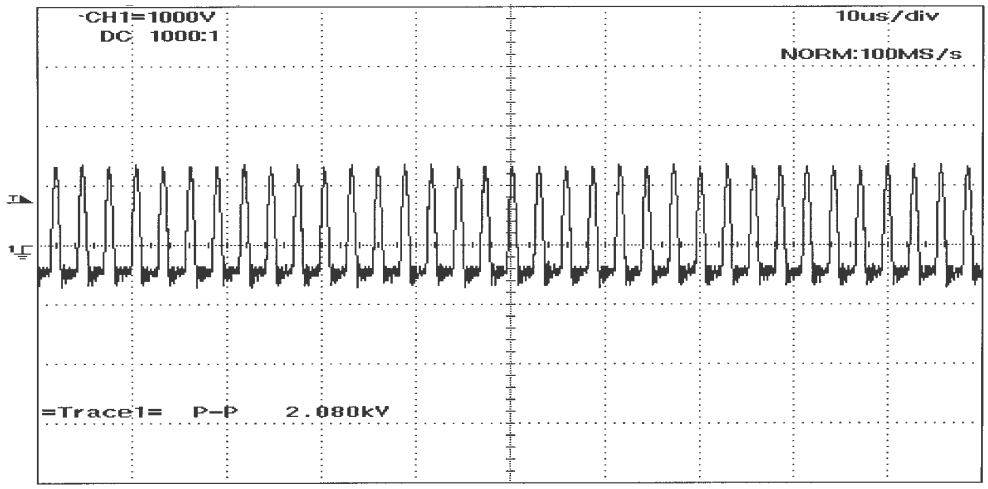
① Output Power (watts)

② Load Resistance (ohms)

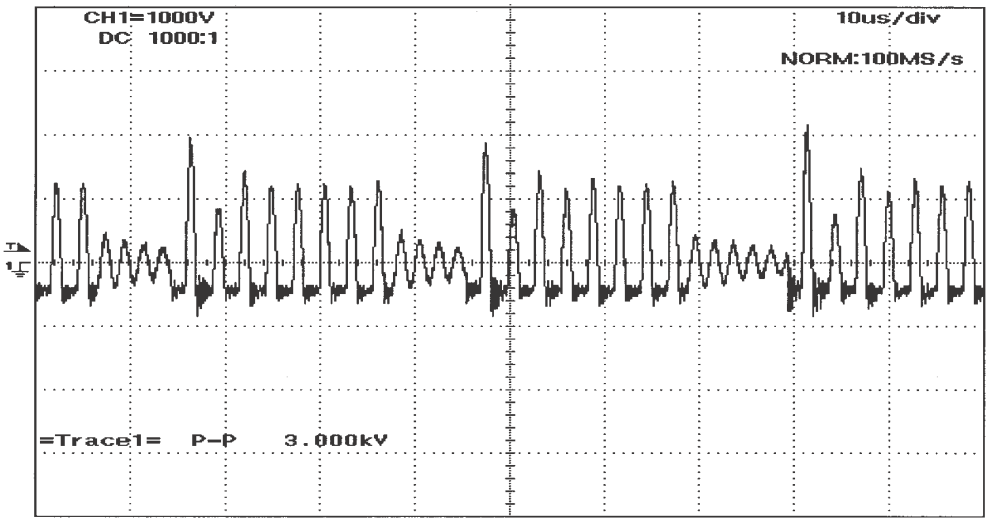
Reference Output Waveforms

The following are the output waveforms as viewed on an oscilloscope.

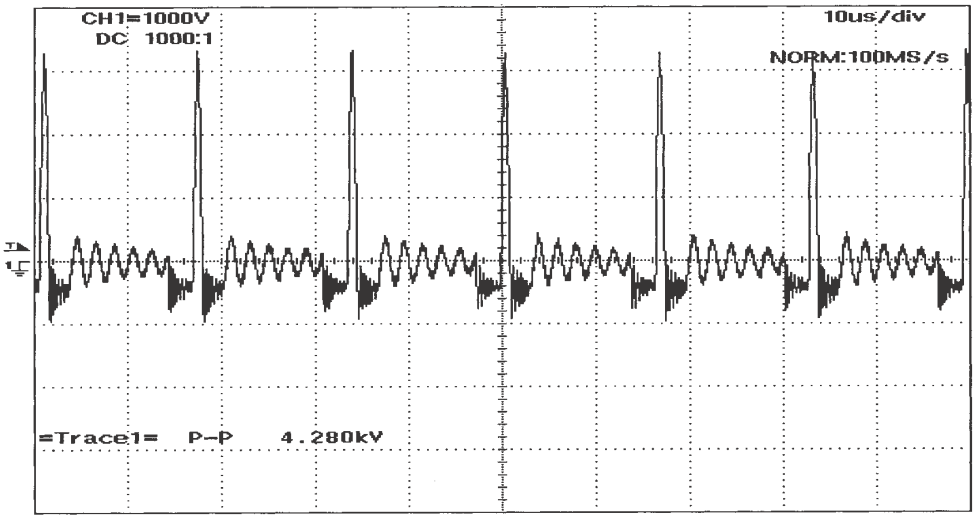
Cut Mode Waveform



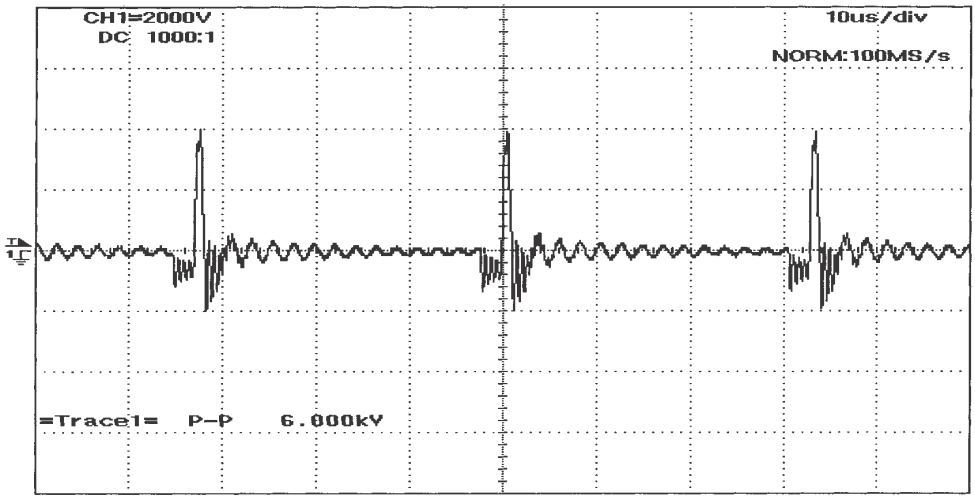
Blend Mode Waveform



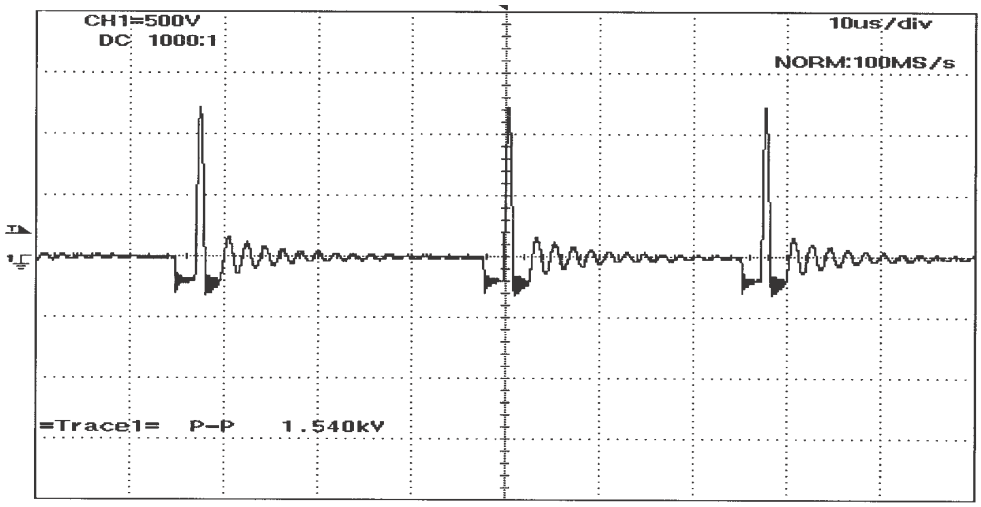
Desiccate Mode Waveform



Fulgurate Mode Waveform



Bipolar Mode Waveform



Chapter 4

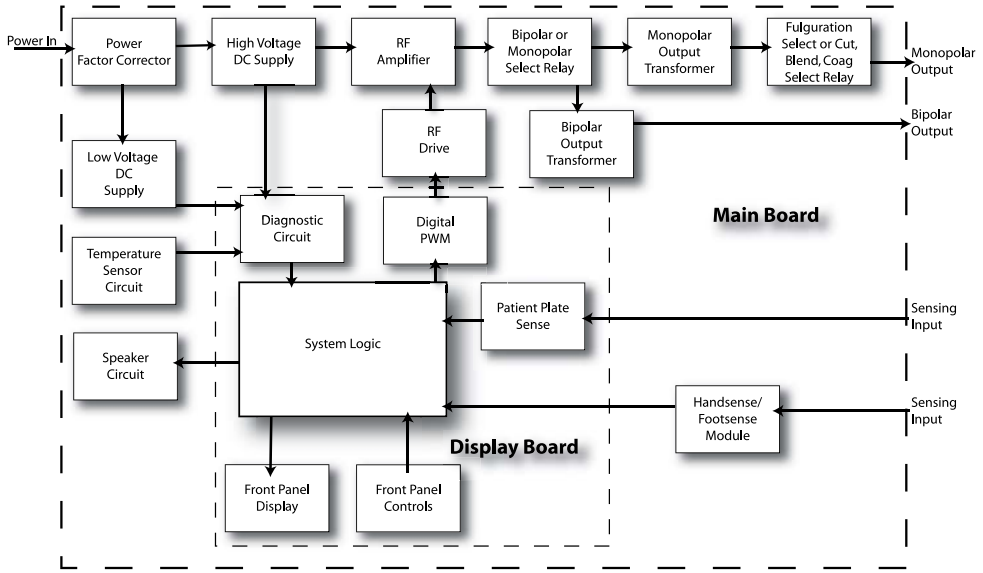
Theory of Operation

This section contains the following information:

- Block diagram
- Functional overview of key circuits
- System logic
- Control signal inputs and outputs

Block Diagram

Functional block diagram of the SurgiStat system



Functional Overview of Key Circuits

The following descriptions highlight the main circuits.

Power Factor Correction Circuit (PFC)

The Power Factor Correction Circuit ensures lower power consumption. The circuit is used to correct the power load that is distributed to the unit's capacitors, providing the lowest voltage required for proper operation of the unit. The PFC also regulates the universal input of 100 to 240 volts that power the unit.

High-Voltage DC Supply

The generator incorporates a high-voltage power supply to generate the RF output power. The high-voltage power supply delivers an unregulated DC output for the RF output. The nominal DC voltage from the high voltage power supply is 80 VDC ± 5 V.

Low-Voltage DC Supplies

The generator incorporates six regulated low-voltage levels to control generator operations. They are: 3.3 VDC, +5 VDC, +12 VDC, -12 VDC, 1.2 VDC, and -16 VDC.

Temperature-Sensing Circuit

System logic uses the temperature-sensing circuit to monitor the internal temperature of the generator. If the temperature rises above 185 °F (85 °C), the system displays error code E7 and disables the RF output.

Speaker Circuit

System logic uses the audio circuit to generate activation tones and alarm tones. You can adjust volume for the activation tones from the back panel of the generator.

Notice

You cannot adjust alarm volume up or down.

Diagnostic Circuit

The diagnostic circuit converts the analog temperature and analog DC voltage measurements to digital values. This information is sent to the control logic for continuous monitoring.

Patient Return Electrode Sensing Circuit

The patient return electrode sensing module senses and sends signals to the system logic, which displays which type of patient return electrode is attached to the patient.

When connecting a single-plate patient return electrode to the generator, the pad-sensing module detects if the resistance is below 5 Ω. If it is below 5 Ω, the SurgiStat displays the green single-plate LED on the front of the generator.

When connecting a split-plate patient return electrode to a patient and the pad-sensing module detects a resistance between 10 and 135 Ω, the SurgiStat displays the green split-plate LED on the front of the generator.

The pad-sensing module constantly monitors the patient contact quality. If the impedance changes by a specific amount, the generator displays an alarm and immediately deactivates the RF output power.

Warning

Patient return electrode contact quality is only monitored when a split-plate patient return electrode is attached to the patient.

RF Amplifier Circuit

The RF amplifier circuit generates the RF output energy that is delivered to the patient. It is a single-ended power amplifier, incorporating three power MOSFETs and two step-up transformers.

The digital PWM circuit and the system-logic unit generate the initial RF drive pulse. When the RF drive pulse turns on the power MOSFETs, current flows from the high-voltage supply through one of the output transformers, depending on which mode the generator is in, through the clamping diodes, and then through the MOSFETs to high-voltage ground.

The energy developed by the on time is stored in an LC tank circuit. When the MOSFETs are off, the energy is delivered to the patient through the output capacitors. A longer on time develops more energy in the LC tank circuit; therefore, more energy is delivered to the patient.

Monopolar Select Circuit

The monopolar select circuit switches the SurgiStat between each of the four monopolar modes. Matrix switches on the front panel allow mode selection. High-voltage relays switch and isolate the four monopolar configurations.

Monopolar/Bipolar Select Relays

The monopolar/bipolar select relays change which output transformer is used to deliver the RF output to the patient.

Controls and Indicators

The SurgiStat generator uses the following controls and indicators:

Membrane switches	These switches toggle between modes.
Displays	Seven segment displays indicate the output power in watts.
Mode indictors	Green LEDs indicate the present mode of the generator.
Power control knobs	These mechanical encoders adjust the output power for each mode.
Power switch	A double-pole, single throw switch snaps into the front bezel. This switch supplies the AC mains current to the generator.

Digital PWM Circuit

The digital Pulse Width Modulation (PWM) circuit controls the output power of the generator. The system logic uses this digitally controlled signal to provide a precise signal to the RF drive.

The power setting (selected by the user) on the front of the generator determines the pulse width.

When the user sets the power, the system logic determines what the pulse width needs to be to deliver the requested output.

System Logic

The control logic uses a field programmable gate array as the generator "brain." This system interprets all inputs and delivers the correct corresponding outputs.

This system controls every operation of the generator.

A system clock circuit, composed of an oscillator, provides the basic operating frequency of 5 MHz.

The reset circuit provides a single pulse when you turn on the SurgiStat generator. This pulse resets the field programmable gate array to ensure proper operation.

SurgiStat Control Signal Inputs and Outputs

The following table lists the important input and output signals. From a troubleshooting standpoint, the absence (and presence) of these signals will help you isolate problem.

Signal Name	Description
TEMP	This is an input signal from the temperature-sense circuit that informs the system logic of the internal temperature of the generator.
AUDIO_DRV	This is an output signal from the system logic that generates the activation tones for all modes of operation. A 610 Hz square wave is generated when the cut or blend mode is activated. A 910 Hz square wave is generated when the desiccation, fulguration, or bipolar mode is activated. This signal is used by the audio circuit.
ALARM_DRV	This is an output signal from the system logic that generates a 2 kHz / 1 kHz square wave for activating the alarm siren. This signal is used by the audio circuit.
PFC_VSENSE_ACT	This is an input signal fro the PFC circuit to measure the high voltage.
PFC_ON	This is an output signal to the PFC circuit to enable the power-factor corrector during RF activation.
PFC_VSENSE_GND	This is an input signal from the PFC circuit to measure the high voltage.
TAP_SEL	This is an output signal from the system logic that controls relays on the main board. The relays select which secondary windings will be used from the monopolar output transformer.

Signal Name	Description
OUT_SEL	This is an output signal from the system logic that controls relays on the main board. They control which output transformer provides the RF output circuit delivered to the patient.
HAND/FOOT_SEL	This is an output signal from the system logic that controls relays on the main board. These relays direct which output jack receives the output RF power. The output power for monopolar modes is switchable from foot-controlled handpiece activation to hand-controlled (switching pencil) activation.
RF_DRV	This is an output signal from the digital PWM circuit that controls the pulse width duration for the RF drive.
SENS_HAND_B	This is an input signal that informs the Hand B request sense circuit. Hand B refers to the Coag button on the handpiece. This signal is generated by a colpitts oscillator located on the main board.
SENS_HAND_A	This is an input signal that informs the Hand A request sense circuit. Hand A refers to the Cut button on the handpiece. This signal is generated by a colpitts oscillator located on the main board.
SENS_FOOT_B	This is an input signal that informs the Foot B request sense circuit. Foot B refers to the Coag pedal on the footswitch. This signal is generated by a colpitts oscillator located on the main board.
SENS_FOOT_A	This is an input signal that informs the Foot A request sense circuit. Foot A refers to the Cut pedal on the footswitch. This signal is generated by a colpitts oscillator located on the main board.
NEM_T1	This is an isolated analog signal used in conjunction to NEM_T2 to measure return electrode contact impedance.
NEM_T2	This is an isolated analog signal used in conjunction to NEM_T2 to measure return electrode contact impedance.

Chapter 5

Generator Operation

This section covers the following topics:

- Inspecting the generator and accessories
- Service personnel safety
- Installation and placement
- Functional (operational) checks
- Operating the generator

Inspecting the Generator and Accessories

Before each use, inspect the generator and all accessories to verify good working order:

- Inspect for physical damage to the generator and its connections.
- Verify that the appropriate accessories and adapters are present.
- Inspect all cords and connectors for signs of wear, damage, and abrasion.
- Verify that the generator displays no error messages when turned on.

Service Personnel Safety

Warning
Hazardous Electrical Output This equipment is for operational use only by a trained, licensed physician. Bio-med technicians must also exercise caution when testing a generator.
Electric Shock Hazard Connect the generator power cord to a properly grounded receptacle. Do not use power plug adapters.
Connect the power cord to a properly polarized and grounded power source with the frequency and voltage characteristics that match those listed on the back of the generator.
Electric Shock Hazard Always turn off and unplug the generator before cleaning.
Fire Hazard Do not use extension cords.
Patient Safety Use the generator only if the self-test has been completed as described.Otherwise, inaccurate power outputs may result.
The instrument receptacles on this generator are designed to accept only one instrument at a time. Do not attempt to connect more than one instrument at a time into a given receptacle. Doing so will cause simultaneous activation of the instruments.
Failure of the high-frequency electrosurgical equipment could result in an unintended increase of output power.
Do not use electrosurgical equipment unless properly trained to use it in the specific procedure being undertaken. Use by physicians without such training has resulted in serious, unintended patient injury, including bowel perforation and unintended, irreversible tissue necrosis.
For surgical procedures where the high-frequency current could flow through parts of the body having a relatively small cross-sectional area, the use of bipolar techniques may be desirable to avoid unwanted coagulation.
If the patient has an implantable cardioverter defibrillator (ICD), contact the ICD manufacturer for instructions before performing an electrosurgical procedure. Electrosurgery may cause multiple activation of ICDs.

Warning

In some circumstances, potential exists for alternate site burns at points of skin contact (e.g.,between the arm and the side of the body). This occurs when electrosurgical current seeks a path to the patient return electrode that includes the skin-to-skin contact point. Current passing through small skin-to-skin contact points is concentrated and may cause a burn. This is true for grounded, ground referenced, and isolated output generators.

To reduce the potential for alternate site burns, do one or more of the following:

- Avoid skin-to-skin contact points, such as fingers touching leg, when positioning the patient.
- Place 5 – 8 cm (2 – 3 in.) of dry gauze between contact points to ensure that contact does not occur.
- Position the return electrode to provide a direct current route between the surgical site and the return electrode which avoids skin-to-skin contact areas.
- In addition, place return electrodes according to the manufacturer's instructions.

Potential for alternate site burns increases if the return electrode is compromised. Covidien recommends the use of split return electrodes and Covidien generators with a contact-quality monitoring system.

Precaution

Do not stack equipment on top of the generator or place the generator on top of electrical equipment. These configurations are unstable and/or do not allow adequate cooling.

Provide as much distance as possible between the electrosurgical generator and other electronic equipment (such as monitors). An activated electrosurgical generator may cause interference with them.

Non-function of the generator may cause interruption of surgery. A backup generator should be available for use.

Do not turn the activation tone down to an inaudible level. The activation tone alerts the surgical team when an accessory is active.

When using a smoke evacuator in conjunction with the electrosurgical generator, place the smoke evacuator at a distance from the generator and set the generator volume control at a level that ensures that the activation tones can be heard.

Notice

If required by local codes, connect the generator to the hospital equalization connector with an equipotential cable.

Connect the power cord to a wall outlet having the correct voltage. Otherwise, product damage may result.

Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

Installation and Placement

Place the SurgiStat electrosurgical generator on any flat surface with a tilt angle of not more than 10 degrees. The generator relies on natural convection cooling. Do not block the rear vents.

Carts with conductive wheels are recommended. For details, refer to the procedures for your institution or to local codes.

Ensure that air flows freely on all sides of the generator. Provide at least 10 –15 cm (4 – 6 in.) of space from the sides and top of the generator for cooling.

Normally, the top, sides, and rear panel are warm when you use the generator continuously for extended periods of time.

Warning

Connect the power cord to a properly polarized and grounded power source with the frequency and voltage characteristics that match those listed on the back of the generator.

Functional (Operational) Checks

Upon initial installation of the generator, perform the following checks. Refer to the figures in Section 2, Controls, Indicators, and Receptacles, for the location of the controls and connectors.

Precaution

At no time should you touch the active electrode or bipolar forceps. A serious burn could result.

How to Set Up and Start the SurgiStat

1. Verify that the power switch is in the Off (O) position and that no accessories are connected to the generator.
2. Connect a hospital-grade power cable to the AC power cable receptacle on the back of the generator, then to a properly grounded wall outlet.
3. Connect a two-pedal footswitch to the matching footswitch receptacle on the back of the generator. Use only a Covidien footswitch with the SurgiStat generator. Although other types of footswitches may fit, they may not be compatible with this electrosurgical generator. Use of an incompatible footswitch may cause unexpected output.

Important

Do not connect a patient return electrode to the front of the generator at this time.

4. Turn on the generator by switching the power switch to the On (|) position.

The correct startup for the generator is a quick flash of all indicators and a series of beeps. The generator will return to the last mode and power setting used.

5. If the self-test is successful, a tone sounds. Verify the following:
   - Cut mode is selected; a Coag or Bipolar mode is selected.
   - Each display shows a power setting. The generator automatically powers up to the last selected modes and their last selected power settings.
   - The patient-return-electrode alarm indicator illuminates red.

If the self-testis not successful, an alarm tone sounds. An error code will appear in the Cut and/or Coag display, inmost cases, the generator is disabled. Note the error code and refer to Chapter 7, *Troubleshooting*.

Once the self-test is successful, connect the accessories and set the generator controls. Refer to Preparing for Monopolar Surgery or Preparing for Bipolar Surgery later in this section.

Setting Up for Monopolar Surgery

Monopolar surgery requires a return electrode.

Applying the Return Electrode

Use the system NEM contact-quality-monitoring patient return electrodes to maximize patient safety. Using a patient return electrode without the safety feature may result in a patient burn.

Notice
The contact-quality-monitoring requires a split return electrode.
Before activation, pad placement and visual verification of the split return electrode (split-pad) indicator on the front panel is recommended. After connecting the split pad to the generator and placing the split pad securely to the patient, give the unit five to 10 seconds to recognize the split pad. The split-pad indicator will illuminate green. If the split pad and cord are attached to the generator without secure contact to the patient, the alarm indicator will illuminate red.

Refer to the patient electrode's instructions for use for recommendations for site selection and placement. When using metal plate return electrodes, use a conductive gel specifically designed for electrosurgery. Select a return electrode site with good blood flow. While a properly applied electrode results in minimal tissue heating beneath the electrode, a good blood flow helps carry heat away from the site.

Connect the return-electrode cable to the receptacle on the front of the generator. The unit automatically detects the presence of a split or solid return electrode. If a split return electrode is in use, the system will constantly monitor the resistance the contact between the electrode and the patient.

Connecting Accessories

1. Connect a monopolar active electrode to the generator.

Notice
Use of a split, quality-monitoring pad is recommended.

Attaching...	Connect to...
Standard 3-pin handswitching pencil	Monopolar handswitching receptacle
Footswitching pencil	Monopolar footswitching receptacle

2. If a footswitch-activated device is being attached, connect a compatible footswitch to the footswitch receptacle on the rear panel of the generator.

Checking the Patient Return Electrode Alarm Function

1. Adjust the power settings for each mode (Pure Cut, Blend, Desiccation, Fulguration, and Bipolar) to 1 W.
2. Press the Cut pedal of the footswitch.
3. Verify that an alarm sounds for three seconds, and then the Patient Return Electrode Sensing Alarm Indicator light illuminates. This indicates the patient return electrode is not connected to the generator.
4. Verify that adjusting the volume control on the back of the generator (while the alarm is sounding) cannot change the alarm's sound level.

Checking the Monopolar Mode (with Footswitch)

1. Select monopolar foot control by pressing the Footswitch Control Selector until the Monopolar Footswitch Control Indicator illuminates.
2. Connect a single-plate patient return electrode to the return electrode receptacle of the generator. Verify that the green single-plate patient return electrode indicator illuminates.
3. Press the Cut pedal on the footswitch. Verify that the Cut and Blend Activation Indicator illuminates and that the system generates the Cut activation tone.
4. While activating the Cut mode, rotate the volume control over the full range to verify that the sound is audible throughout the range.
5. Press the coag pedal on the footswitch. Verify that the Desiccate, Fulgurate, and Bipolar Activation Indicator illuminates and that the system generates the coagulation activation tone.
6. While activating the Coag mode, rotate the volume control over the full range to verify that the sound is audible throughout the range.

Checking the Monopolar Mode (with Handswitch)

1. Connect a handswitching handpiece to the Monopolar handswitching receptacle.
2. Activate, one at a time, the Cut and Coag handswitching controls. Verify that each control causes the correct indicator and tone to sound.

Setting Up for Bipolar Surgery

Notice
Bipolar surgery does not require a return electrode.

1. Press the Bipolar mode selector on the front of the generator. The Bipolar Mode indicator will illuminate.
2. Select Bipolar footswitching by pressing the Foot Control selector.
3. Select the Bipolar mode by pressing the Bipolar mode switch on the front panel.

   Note: The generator automatically changes to bipolar footswitching when you select the Bipolar mode.
4. Connect a Bipolar cable to the Bipolar receptacle.
5. Connect the compatible footswitch to the Monopolar Footswitch receptacle on the rear of the unit. The receptacle works for both Monopolar and Bipolar footswitching activation.
6. Connect a forceps instrument to the Bipolar cable.

Checking the Bipolar Mode (with Footswitch)

1. Select the Bipolar mode by pressing the Bipolar mode switch on the front panel.

   Note: The generator automatically changes to bipolar footswitching when you select the Bipolar mode.
2. Verify that the Bipolar mode LED illuminates green, and that the system generates the coag tone when you press the Coag pedal (blue) or the Cut pedal (yellow) on the footswitch.
3. While activating the Bipolar mode, rotate the volume control over the full range to verify that the sound is audible throughout the range.
4. Confirm that releasing the Coag pedal or Cut pedal returns the generator to an idle state.

Operating the Generator

Operation Safety

Warning

Do not wrap the accessory cords or patient return electrode cords around metal objects. This may induce currents that could lead to shocks, fires, or injury to the patient or surgical team.

Danger - Fire / Explosion Hazard Do not use the generator in the presence of flammable anesthetics.

Fire/Explosion Hazard—The following substances will contribute to increased fire and explosion hazards in the operating room:

- Flammable substances (such as alcohol based skin prepping agents and tinctures)
- Naturally occurring flammable gases which may accumulate in body cavities such as the bowel
- Oxygen-enriched atmospheres
- Oxidizing agents (such as nitrous oxide [N_20] atmospheres).

The sparking and heating associated with electrosurgery can provide an ignition source. Observe fire precautions at all times. When using electrosurgery in the same room with any of these substances or gases, prevent their accumulation or pooling under surgical drapes, or within the area where electrosurgery is performed.

Use the lowest output setting necessary to achieve the desired surgical effect. Use the active electrode only for the minimum time necessary in order to lessen the possibility of unintended burn injury. Pediatric applications and/or procedures performed on small anatomic structures may require reduced power settings. The higher the current flow, and the longer the current is applied, the greater the possibility of unintended thermal damage to tissue, especially during use on small structures.

Use electrosurgery with caution in the presence of internal or external devices such as pacemakers or pulse generators. Interference produced by the use of electrosurgical devices can cause devices such as pacemakers to enter an asynchronous mode or can block the pacemaker effect entirely. Consult the device manufacturer or hospital Cardiology Department for further information when use of electrosurgical appliances is planned for patients with cardiac pacemakers or other implantable devices.

Precaution

The use of high-frequency current can interfere with the function of other electromagnetic equipment.

When high-frequency surgical equipment and physiological monitoring equipment are used simultaneously on the same patient, place any monitoring electrodes as far as possible from the surgical electrodes.

Do not use needles as monitoring electrodes during electrosurgical procedures. Inadvertent electrosurgical burns may result.

Precaution
To avoid the possibility of an electrosurgical burn to either the patient or the physicians, do not allow the patient to come in contact with a grounded metal object during activation. When activating the unit, do not allow direct skin contact between the patient and the physician.
To avoid the possibility of a burn to the patient, when using a split pad do not activate the unit if the solid pad indicator is illuminated green or the red alarm indicator remains illuminated red. This could indicate improper pad placement or a faulty NEM contact-monitoring circuit.
Remove any jewelry from the patient before activation.
Examine all accessories and connections to the electrosurgical generator before use. Ensure that the accessories function as intended. Improper connection may result in arcs, sparks, accessory malfunction, or unintended surgical effects.
When not using active accessories, place them in a holster or in a clean, dry, non-conductive, and highly visible area not in contact with the patient. Inadvertent contact with the patient may result in burns.
Studies have shown that smoke generated during electrosurgical procedures can be potentially harmful to patients and the surgical team. These studies recommend adequately ventilating the smoke by using a surgical smoke evacuator or other means.[1]

1. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health (NIOSH). Control of Smoke from Laser/Electric Surgical Procedures. HAZARD CONTROLS, Publication No. 96-128, September, 1996.

Activating the Generator

Monopolar Cut	Select the desired mode of operation (Pure Cut or Blend), then select the power settings by rotating the Cut and Blend Power Control Dial.
Monopolar Coag	Select the coag mode of operation (Desiccate or Fulgurate), then select the power setting by rotating the Coag and Bipolar Power Control Dial.
Bipolar	Select the mode of operation for Bipolar (coagulation or fulguration), then select the bipolar power settings by rotating the Coag and Bipolar Power Control Dial.

Activate the generator by pressing the appropriate button on the handswitch or footswitch.

Notice
One footswitch can activate either monopolar or bipolar operation.

Monopolar Operation		
To activate...	**Press this...**	**On this device...**
Pure Cut or Blend modes	Yellow button	Handswitching pencil
	Yellow or Cut pedal	Footswitch
Desiccate or Fulgurate modes	Blue button	Handswitching pencil
	Blue or Coag pedal	Footswitch
Bipolar Operation		
Bipolar mode	Blue (Coag) or yellow (Cut) pedal	Footswitch

Chapter 6

Maintaining the Generator

This section covers the following topics:

- Cleaning
- Periodic inspection
- Fuse replacement

Covidien recommends that periodic inspection and performance testing be performed every six months. A qualified biomedical technician should conduct this testing to ensure that the unit is operating effectively and safely.

Cleaning

After each use, clean the generator.

Warning

Electric Shock Hazard Always turn off and unplug the generator before cleaning.

Precaution

Do not allow fluids to enter the generator chassis.

Do not sterilize the generator.

Notice

Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

1. Turn off the generator, and unplug the power cord from the wall outlet.
2. Thoroughly wipe all surfaces of the generator and power cord with a mild cleaning solution or disinfectant and a damp cloth. Follow the procedures approved by your institution or use a validated infection control procedure.

Periodic Inspection

Every six months, visually inspect the generator for signs of wear or damage. In particular, look for any of the following problems:

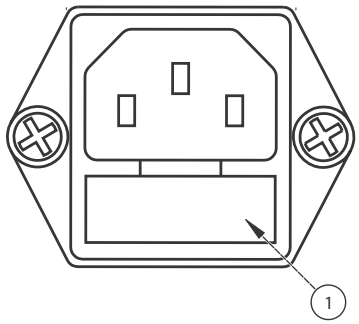
- Damage to the power cord
- Damage to the power cable receptacle
- Obvious damage to the unit
- Damage to any receptacle
- Accumulation of lint or debris in or around the unit

Fuse Replacement

Fuses for the unit reside directly below the power cable receptacle on the rear of the unit.

To replace the fuses, follow this procedure:

1. Unplug the power cord from the wall outlet.
2. Remove the power cord from the power cable receptacle on the rear panel.
3. To release the fuse drawer, insert a small flathead screwdriver into the slot on the drawer below the power cord receptacle and slide the drawer out.



① Fuse Drawer

4. Remove the two fuses (T3.15AL250V) and replace them with new fuses with the same values.
5. Insert the fuse drawer into the power cable receptacle.

Use the following fuses:

	SurgiStat 100-240 V
VAC	250
Amps	3.15 A
Type	Slow Blow
Size	5 x 20 mm

Important

If the unit does not display an error and does not power on, check fuses.

Chapter 7

Troubleshooting

This chapter includes error code descriptions and actions to take to resolve them.

Recommended Equipment for Troubleshooting

Use the following equipment to troubleshoot the SurgiStat electrosurgical generator.

- Digital multimeter with leads
- Electrosurgical analyzer or a true RMS voltmeter, such as a Fluke 8920A
- Wideband current transformer, such as a Pearson 4100
- Noninductive RF load resistors 200 Ω, 500 Ω, 800 Ω, 1000 Ω
- Oscilloscope (dual channel) at 100 MHz
- Oscilloscope probes, (2) 10X and 1000X
- Covidien footswitch
- Covidien handswitching pencil (single use or reusable)
- Standard technician's tool kit
- Miscellaneous test leads and cables

Troubleshooting the Generator

If the generator is not functioning properly, use the information in this section to perform the following activities:

- Identify and correct the malfunction.
- If the system displayed an error code, take the appropriate action(s) to correct the error condition.

Inspecting the Generator

If the generator malfunctions, check for obvious conditions that may have caused the problem.

1. Check the generator for visible signs of physical damage.
2. Verify that all accessory cords are properly connected.
3. Check the power cord. *Replace the power cord if you find exposed wires, cracks, frayed insulation, or a damaged connector.*
4. Open the fuse drawer and inspect the fuse housing and fuses for damage and corrosion.
5. Verify that the fuses are firmly seated. *An internal component malfunction in the generator can damage the fuses.*
6. Fuses may need to be replaced if the generator fails the self-test or stops functioning. Refer to *Fuse Replacement* on page 6-3.

Inspecting the Receptacles

Equipment required:

- Footswitch
- Bipolar cable
- Monopolar instruments (handswitch and footswitch)
- Return electrode cable

Procedure:

1. Turn off the generator.
2. Disconnect the power cord from the wall receptacle.
3. Check the footswitch receptacle on the rear of the generator for obvious signs of obstruction and damage.
4. Insert the footswitch connector into the footswitch receptacle. Check for a secure fit. Use only a Covidien footswitch with the SurgiStat generator.

   If the footswitch receptacle is damaged, contact your Covidien Service Center.
5. Check the bipolar receptacle on the front of the generator for obstruction or damage.
6. Insert a bipolar cable into the bipolar receptacle on the front of the generator. Check for a secure fit.

   If the bipolar receptacle is damaged, contact your Covidien Service Center.
7. Check the monopolar receptacle on the front of the generator for obstruction or damage.
8. Insert a handswitching pencil into the monopolar handpiece receptacle on the front of the generator. Check for a secure fit.

   If the monopolar handpiece receptacle is damaged, contact your Covidien Service Center.
9. Check the monopolar foot-controlled receptacle on the front of the generator for obstruction or damage.
10. Insert a monopolar foot-controlled handpiece into the monopolar foot-controlled receptacle on the front of the generator. Check for a secure fit.

    If the monopolar foot controlled receptacle is damaged, contact your Covidien Service Center.
11. Check the patient return electrode receptacle on the front of the generator for a broken pin or an obstruction.
12. Insert a return electrode cable into the return electrode receptacle, and check for a secure fit.

If the return electrode receptacle on the front of the generator is damaged, contact your Covidien Service Center.

Inspecting Internal Components

Precaution
The generator contains electrostatic-sensitive (ESS) components. When repairing the generator, work at a static-control workstation.
Wear a grounding strap when handling electrostatic-sensitive components.
Handle circuit boards by their nonconductive edges.
Use an anti-static container for transport of electrostatic-sensitive components and circuit boards.

To inspect internal components, follow this procedure.

1. Remove the four screws that secure the cover to the chassis.
2. Lift the cover from the chassis. Set the cover and screws aside for reinstallation.
3. Visually inspect and verify all connectors are firmly seated.
4. Inspect each board for damaged components, wires, cracks, and corrosion.
5. Reinstall the cover by positioning the cover over the chassis. Secure with the original screws.

Understanding Error Codes and Audio Tones

The SurgiStat generator includes automatic, continual self-diagnostics. If the diagnostics detect an error, the system displays an error code, sounds an audible tone, and deactivates the output power.

Any errors detected will shut down the RF output power.

Notice
Internal firmware self-diagnostics continually monitor generator operation to ensure proper and safe performance.

Most error codes result from faults in accessories attached to the generator. The following table lists the error codes, describes the error, and recommends actions to take to resolve the error

Error Code	Description	Recommended Action
F1 on the Cut/Blend display	Handswitch or monopolar footswitch cut pedal may be stuck	1) Turn off, then turn on the generator. Do not press buttons or accessory activation devices during the self-test. 2) If the error coder reappears, disconnect all accessories. Turn off, then turn on the generator again. 3) If the problem persists, replace the handpiece or footswitch and repeat the restart. 4) If the error code reappears, record the number and contact your Covidien Service Center.
F1 on the Desiccate/ Fulgurate/Bipolar display	Handswitch or monopolar footswitch coag pedal may be stuck .	
F2 Simultaneous activation error	Cut and Coag buttons activated simultaneously (pencil or footswitch).	The generator does not allow simultaneous activation of the Cut and Desiccation modes. Release either the Cut or Coag button on the handpiece, or the Cut or Coag pedal on the footswitch.
F3 Foot activation error	Footswitch Cut or Coag pedal pressed while in Bipolar Foot Control and the generator is in Bipolar mode.	Release pressure on the handpiece buttons. Use the footswitch to activate bipolar, or switch to monopolar mode.
E4 High voltage error	Line voltage error (Line voltage too high.	1) Turn the generator off. 2) Verify that the generator is connected to the correct line voltage. 3) If the error code reappears, record the number and contact your Covidien Service Center.

Error Code	Description	Recommended Action
E7 Temperature error	Internal temperature of the generator exceeded limit.	1) Turn the generator off. 2) Allow the generator to cool for 20 minutes. 3) Restart the generator. 4) If the error code reappears, record the number and contact your Covidien Service Center.
E8 Connector sense error	The generator shall monitor the connection of the main cable between the main and display boards.	1) If the cable is disconnected, an E8 error will be displayed. 2) The generator cannot be activated while the error condition is present. 3) Restart the generator to remove the error condition.

Correcting Common Problems

If a solution is not readily apparent, use the following table to help identify and correct specific malfunctions. After you correct the malfunction, verify that the generator successfully completes the self-test.

Situation	Possible cause	Recommended action
Generator does not respond when turned on	Disconnected power cord, faulty wall receptacle, or faulty power cord	1) Check power cord connections (generator and wall receptacle). 2) Connect the power cord to a functional wall receptacle. If necessary, replace the power cord.
	Fuse drawer is open or fuses blown	1) Close the fuse drawer. If necessary, replace the fuse(s). 2) If a problem persists, contact your Covidien Service Center.
	Loose or disconnected internal cables	Contact your Covidien Service Center.
	Faulty power entry module or connections	
	Faulty power switch	
Generator is on, but did not complete the self-test	Alarm condition exists	Check the display for an error code. Note the number and refer to error code list.
	Loose or disconnected internal cables	Contact your Covidien Service Center.
	Faulty power switch	
	Main board malfunction	
	Display board malfunction	
Activation and/or alarm tones do not sound; speaker is malfunctioning	Loose or damaged connection between speaker board and main board	Contact your Covidien Service Center.
	Loose or disconnected cable between main board and display board	
	Main board malfunction	
	Display board malfunction	

Situation	Possible cause	Recommended action
Blank or confusing LED display	Faulty ribbon cable between main board and display board	Contact your Covidien Service Center.
	Display board malfunction	
Mode buttons do not operate correctly when pressed	Loose or disconnected cable between main board and display board	Contact your Covidien Service Center.
	Loose or disconnected cable between front panel overlay and display board	
	Damaged front panel overlay	
Generator is on and the accessory is activated, but generator does not deliver output	Malfunctioning footswitch or handswitching instrument	1) Turn off the generator. Check and correct all accessory connections. 2) Turn on the generator. 3) Replace the accessory if it continues to malfunction.
	Display board malfunction	Contact your Covidien Service Center.
	Power set too low	Increase the power setting.
	An error condition exists	1) Check the Cut and Coag displays for an error code number. 2) Note the number and refer to the error codes descriptions in this section.
	Main board malfunction	Contact your Covidien Service Center.
	RF output stage malfunction	
Footswitch will not activate output	Malfunctioning or damaged footswitch receptacle	Contact your Covidien Service Center.
	Footswitch activation signal lost on main board	
	Incompatible footswitch	Use only a Covidien footswitch with the SurgiStat generator.

Situation	Possible cause	Recommended action
Continuous monitor interference	Faulty chassis-to-ground connections	1) Check and correct the chassis ground connections for the monitor and, if applicable, for the generator. 2) Check other electrical equipment in the room for defective grounds.
	Electrical equipment is grounded to different objects rather than a common ground Generator may respond to the resulting voltage differences between grounded objects	Plug all electrical equipment into line power at the same location.
	Malfunctioning monitor	Replace the monitor.
Interference with other devices only when generator is activated	Metal-to-metal sparking	Check all connections to the generator, patient return electrode, and accessories.
	High settings used for fulguration	Use lower power settings for fulguration or select the Desiccate mode.
	Electrically inconsistent ground wires in the operating room	Verify that all ground wires are as short as possible and go to the same grounded metal.
	If interference continues when the generator is activated, the monitor is responding to radiated frequencies	Check with the manufacturer of the monitor. Some manufacturers offer RF choke filters for use in monitor leads. The filters reduce interference when the generator is activated and minimize the potential for an electrosurgical burn at the site of the monitor electrode.

Situation	Possible cause	Recommended action
Pacemaker interference	Intermittent connections or metal-to-metal sparking	1) Check all connections to the generator. 2) It may be necessary to re-program the pacemaker.
	Current traveling from active to return electrode during monopolar electrosurgery is passing too close to pacemaker	1) Use bipolar instruments, if possible. If you must use a monopolar instrument, place the patient return electrode as close as possible to the surgical site. 2) Make sure the current path from the surgical site to the patient return electrode does not pass through the vicinity of the heart or the site where the pacemaker is implanted. 3) Always monitor patients with pacemakers during surgery and keep a defibrillator available. 4) Consult the pacemaker manufacturer or hospital. 5) Contact the hospital's Cardiology Department for further information when use of electrosurgical appliances is planned on patients with cardiac pacemakers.
Abnormal neuromuscular stimulation (stop surgery immediately)	Metal-to-metal sparking	Check all connections to the generator, patient return electrode, and active electrodes.
	Can occur during coag	Use a lower power setting for the Fulgurate mode or select the Desiccate mode.
	Abnormal 50-60 Hz leakage currents	Contact your Covidien Service Center.

Chapter 8

Repair Policy and Procedures

This chapter contains the following information:

- The manufacturer's responsibility
- Returning the generator for service
- Finding service centers

Responsibility of the Manufacturer

Covidien is responsible for the safety, reliability, performance, and service of the generator only under the following circumstances:

- The user has followed the installation and setup procedures in this manual.
- Persons authorized by Covidien performed assembly operation, readjustments, modifications, or repairs.
- The electrical installation of the relevant room complies with local codes and regulatory requirements, such as IEC and BSI.
- Equipment use is in accordance with the Covidien instructions for use.

For warranty information, refer to the *Limited Warranty* in the Preface.

Returning the Generator for Service

Before you return the SurgiStat, call your Covidien representative for assistance. If instructed to send the generator to Covidien, first obtain a Return Authorization Number. Then, clean the SurgiStat and ship it to Covidien for service.

Step 1 – Obtain a Return Authorization Number

Call the Covidien Customer Service Center for your area to obtain a Return Authorization Number. Have the following information ready when you call:

- Hospital/clinic name/customer number
- Telephone number
- Department/address, city, state, and zip code
- Model number
- Serial number
- Description of the problem
- Type of repair to be done

Step 2 – Clean the Generator

Warning

Electric Shock Hazard Always turn off and unplug the generator before cleaning.

Precaution

Do not allow fluids to enter the chassis.

Do not attempt to sterilize the generator.

Notice

Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

1) Turn off the generator, and unplug the power cord from the wall outlet.
2) Thoroughly wipe all surfaces of the generator and power cord with a mild cleaning solution or disinfectant and a damp cloth. Follow the procedures approved by your institution or use a validated infection control procedure.

Step 3 – Ship the Generator

1) Attach a tag to the generator that includes the return authorization number and the information (hospital, phone number, etc.) listed in *Step 1 – Obtain a Return Authorization Number* on page 8-2.
2) Be sure the generator is completely dry before you pack it for shipment. Package it in its original shipping container. If the original shipping container is not available, request one when obtaining your Return Authorization Number.
3) Ship the generator, prepaid, to the Covidien Service Center.

Service Centers

For a complete list of service centers worldwide, please refer to the Covidien web site:

http://surgical.covidien.com/service-centers

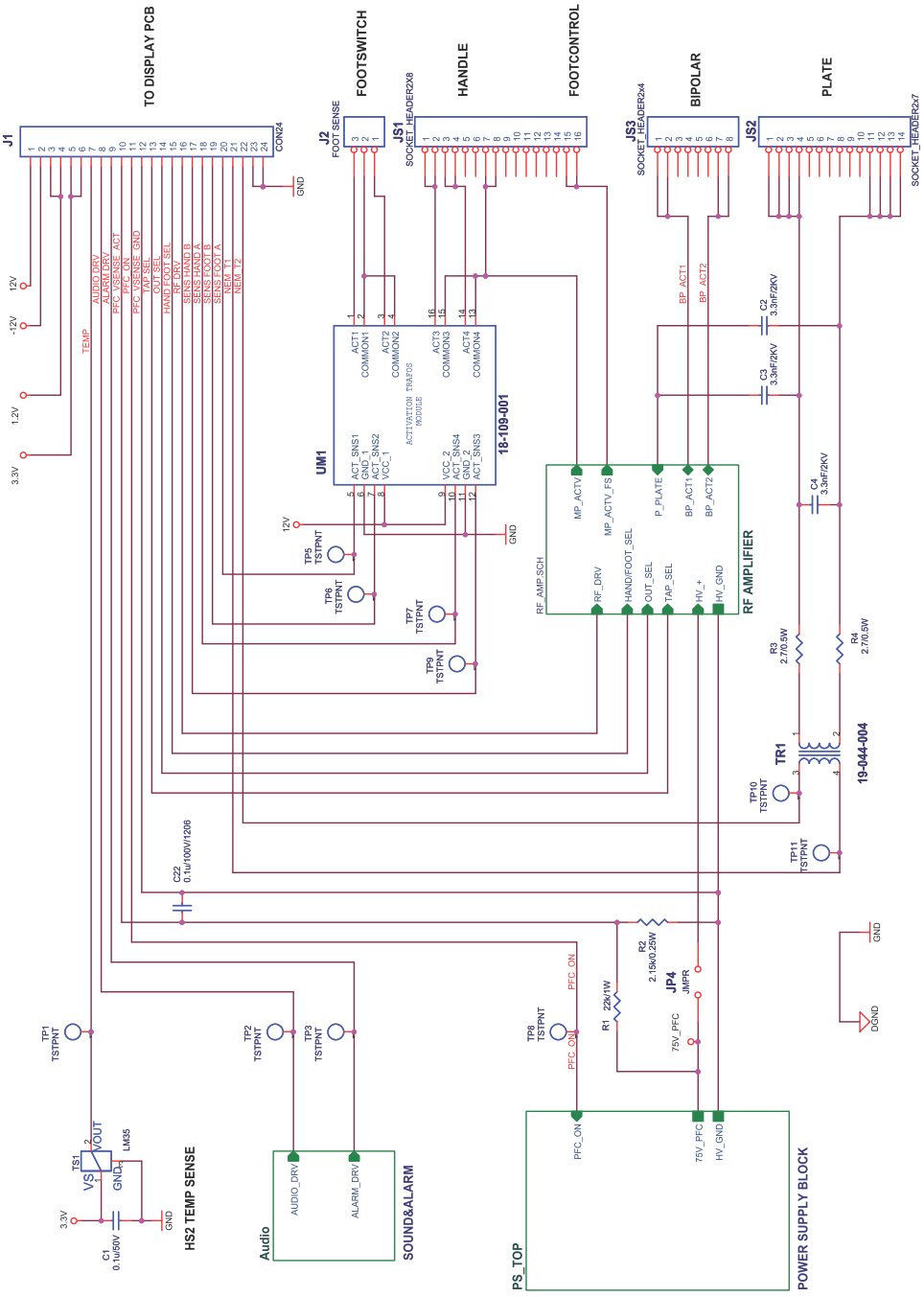
Chapter 9

Board Drawings and Schematics

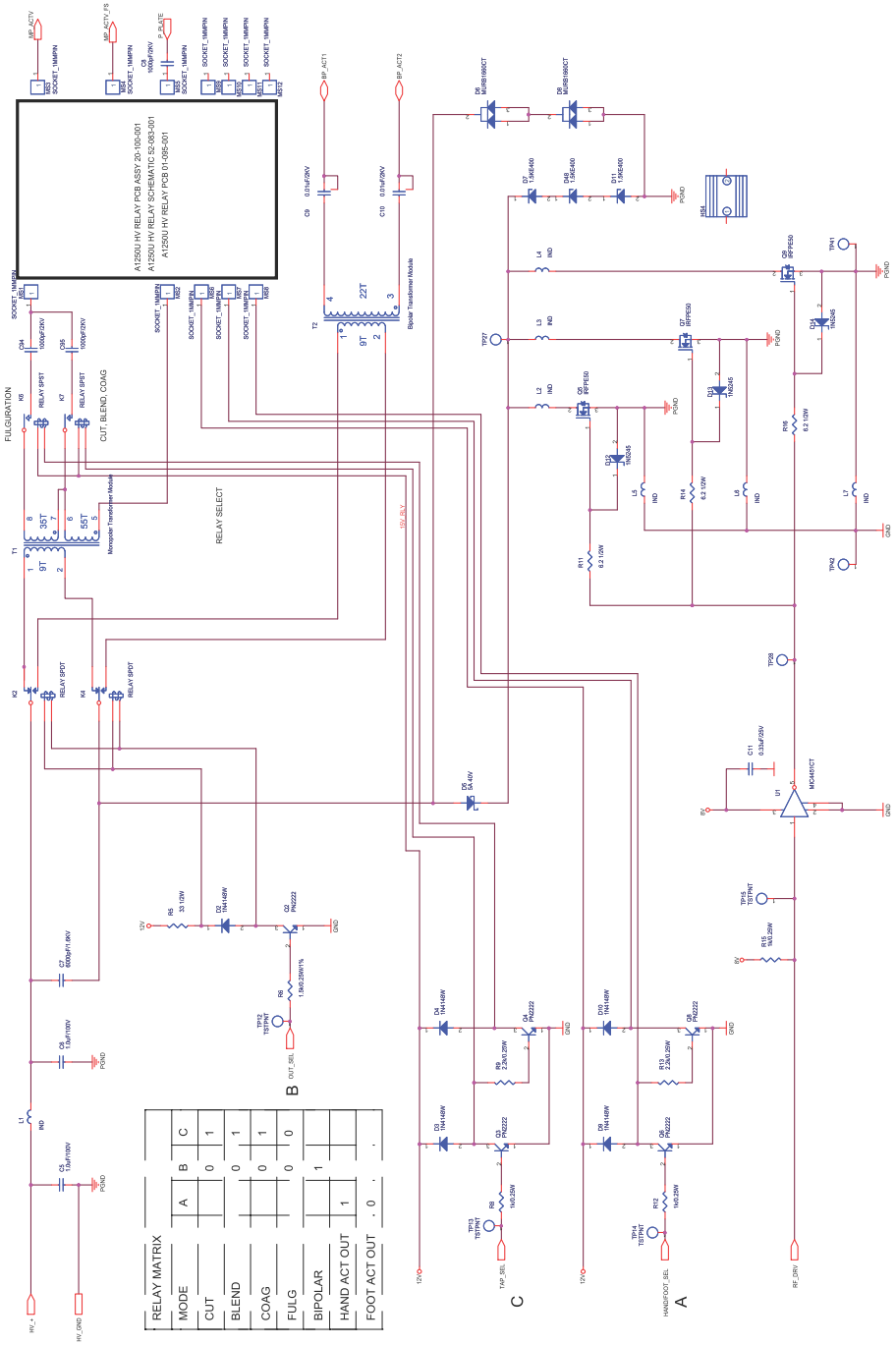
This chapter contains the assembly drawings and schematics for the following printed circuit boards:

- Main board
- Display board
- Relay board
- Connector board

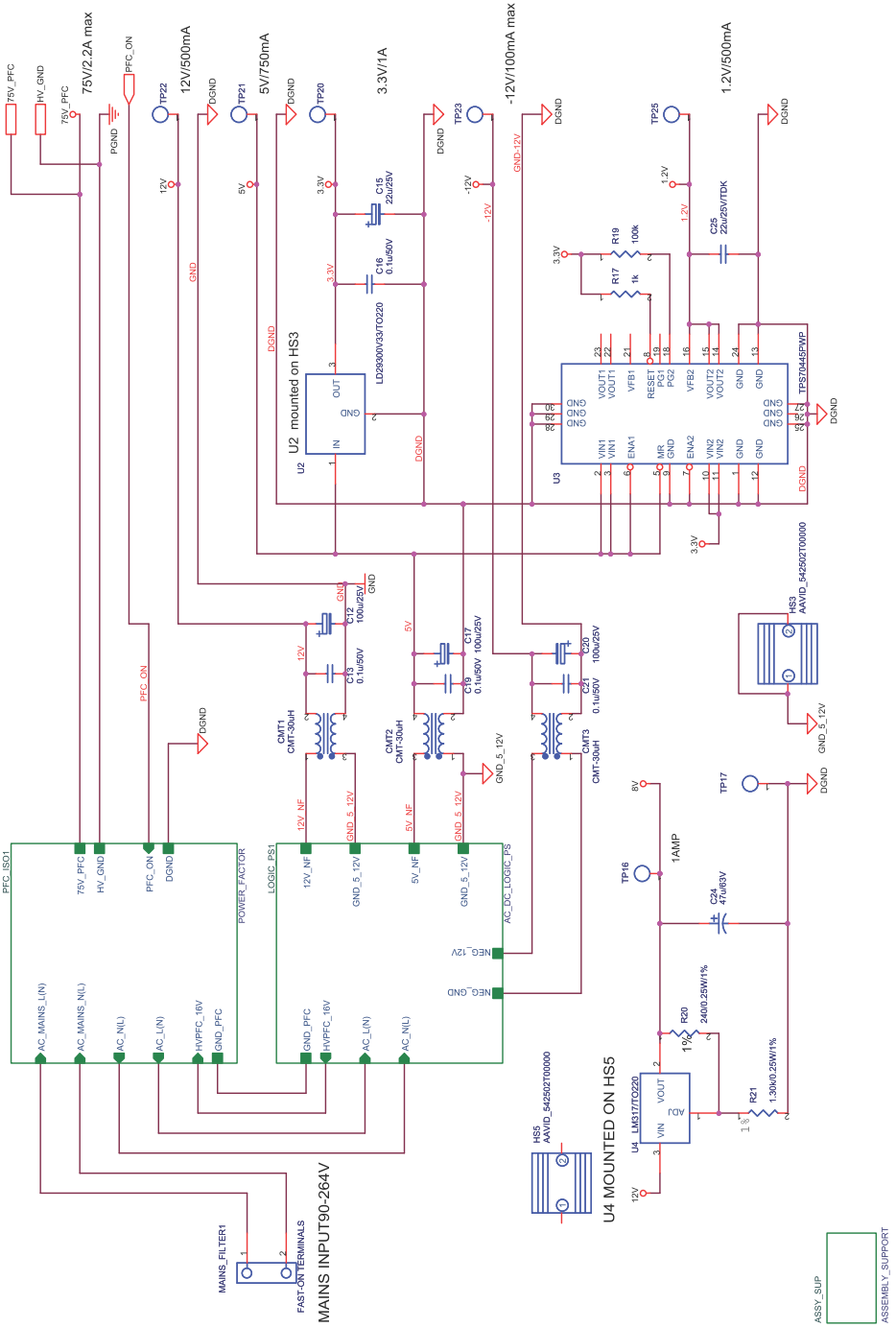
Main Board Top Level Block



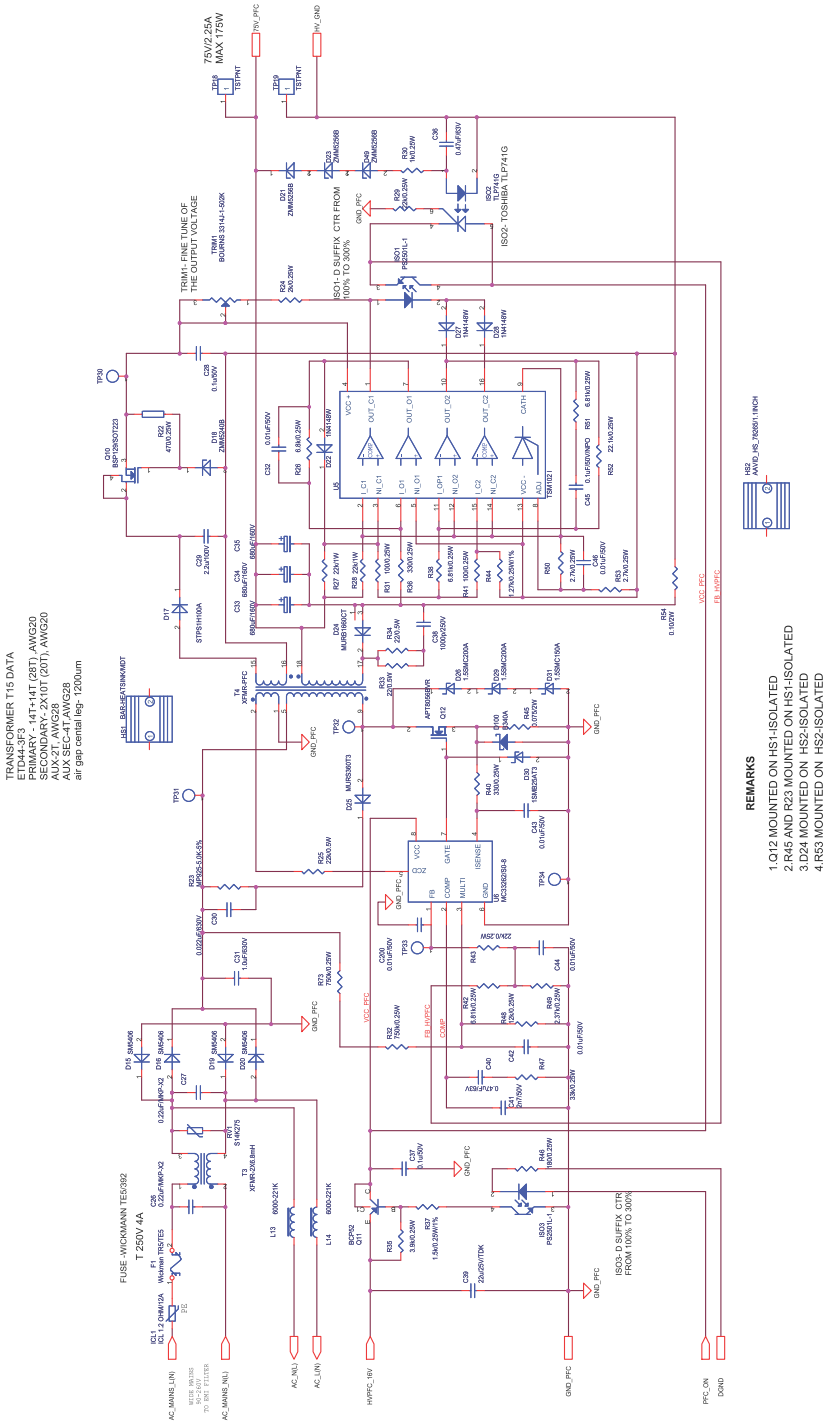
Main Board RF Amplifier Circuit



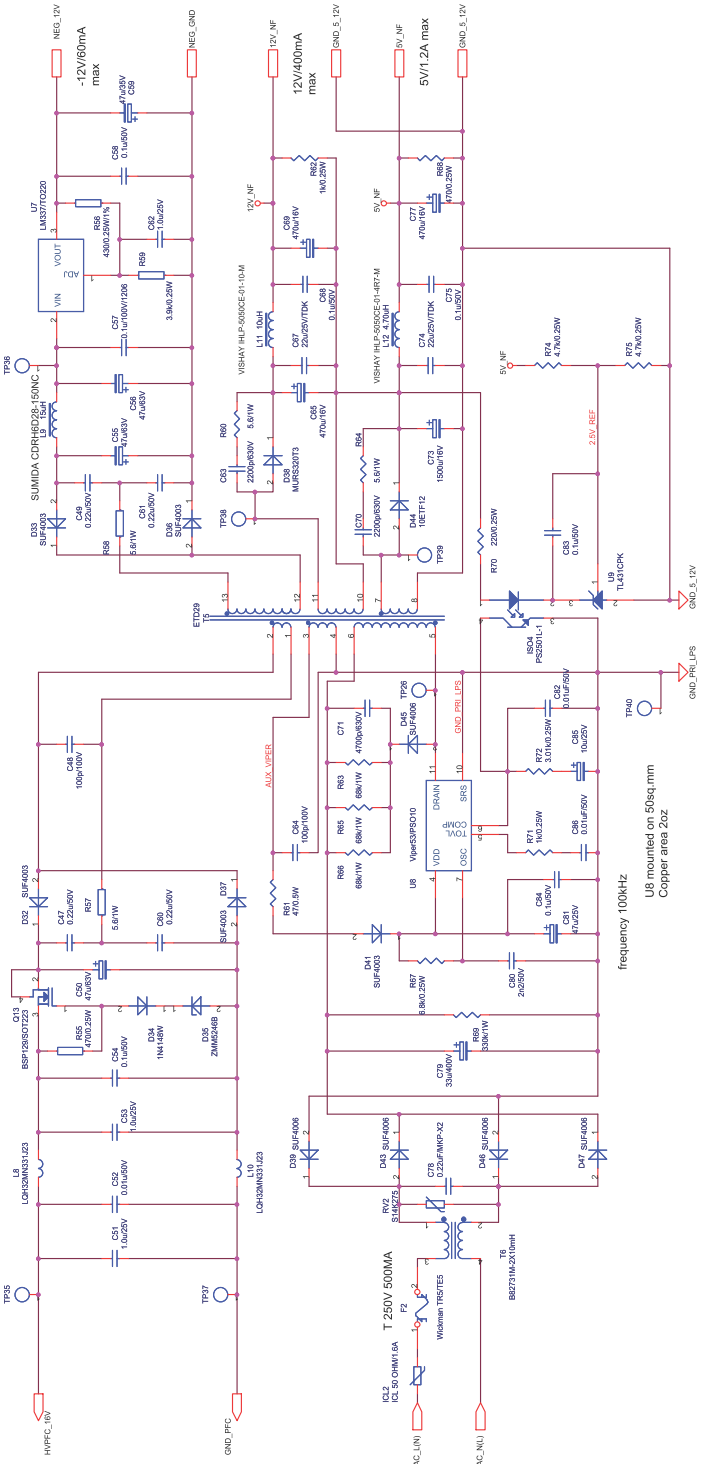
Main Board Power Supply Block



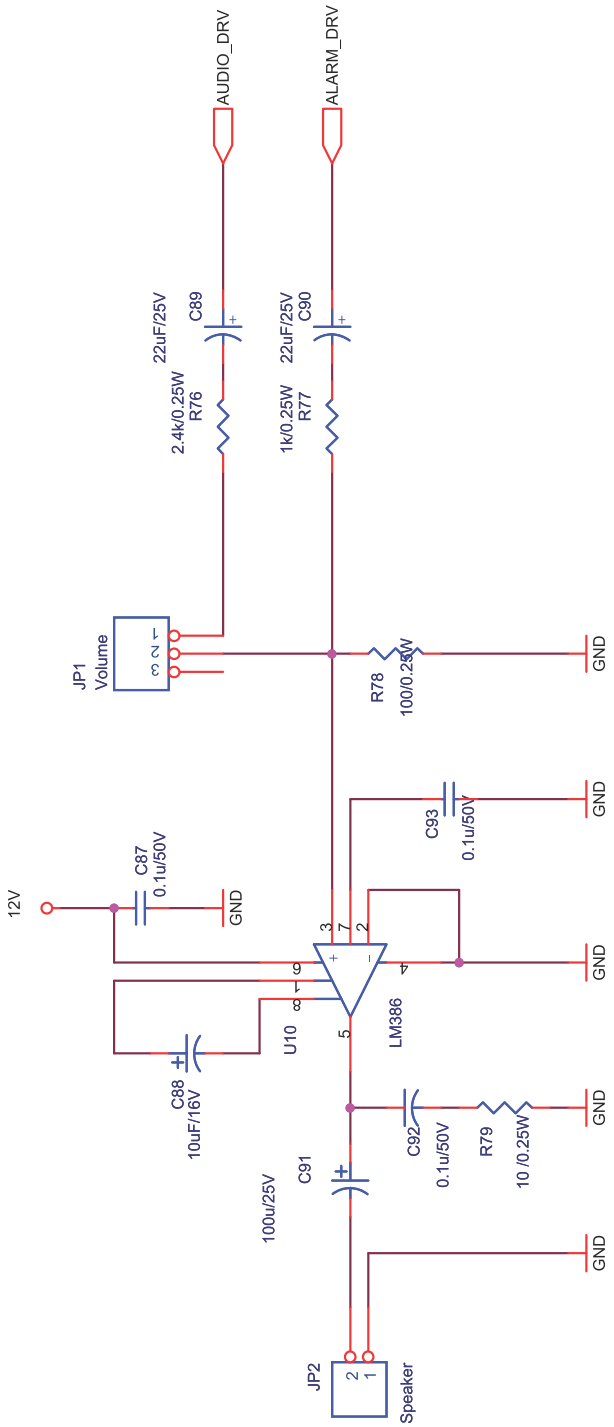
Main Board Isolated Power Factor Corrector Circuit



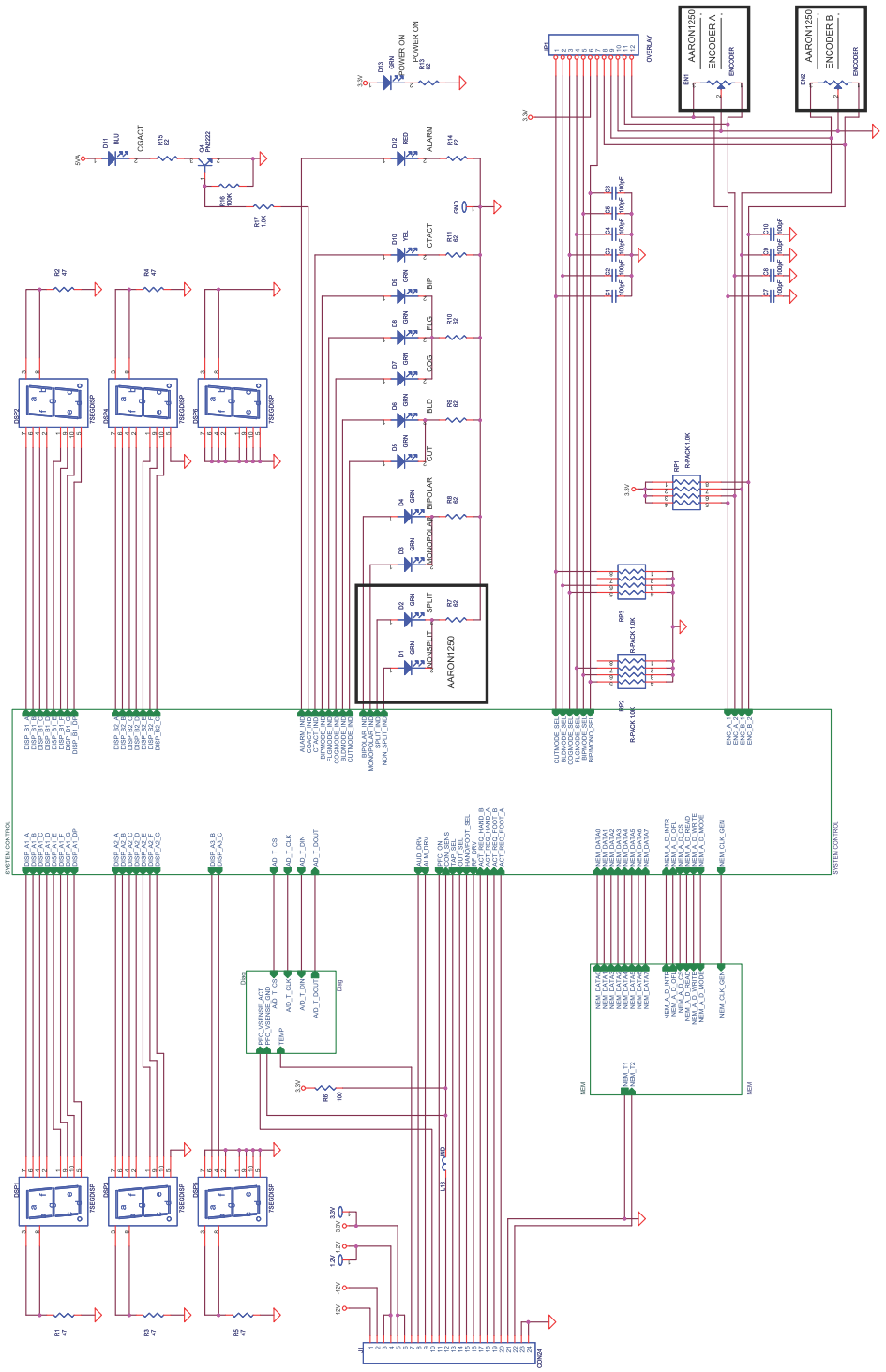
Main Board Logic Power Supply Circuit



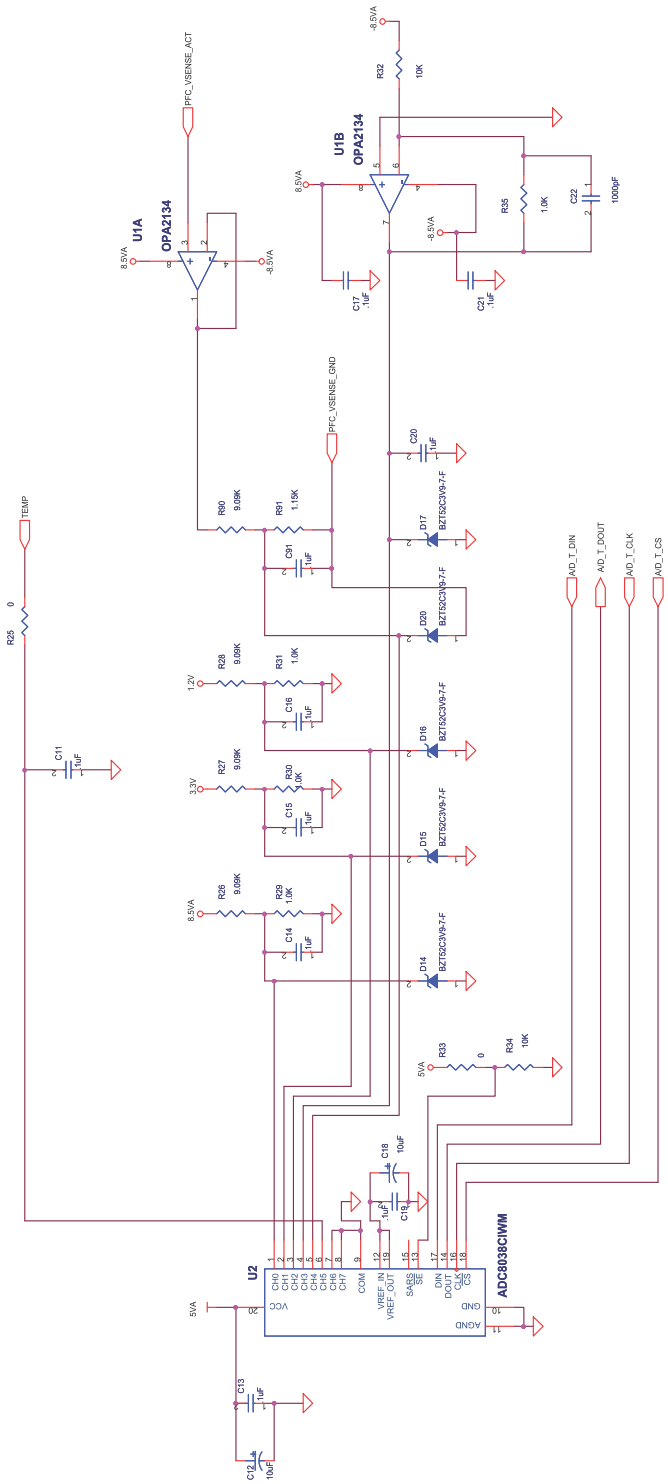
Main Board Audio Circuit



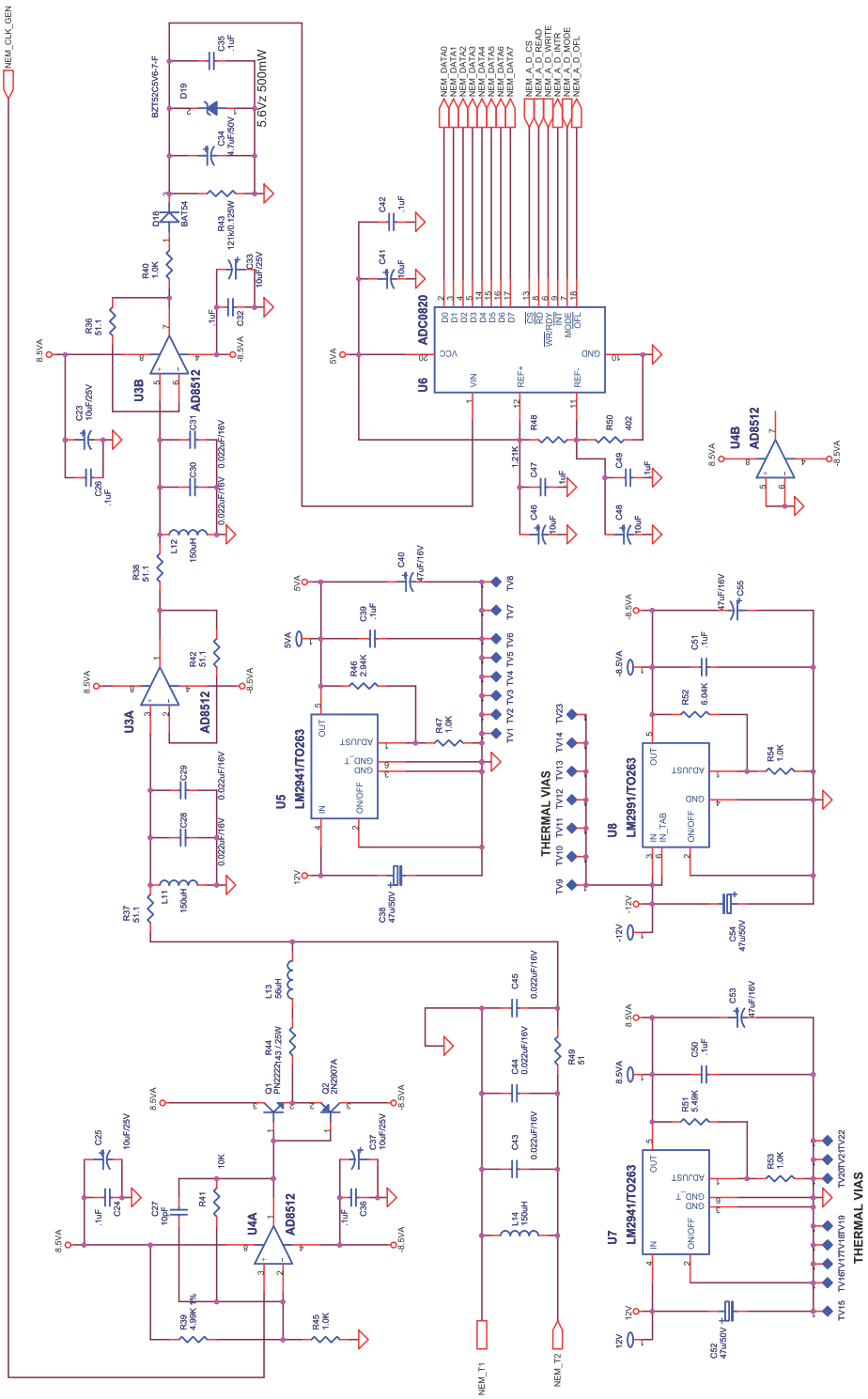
Display Board Top Level Block



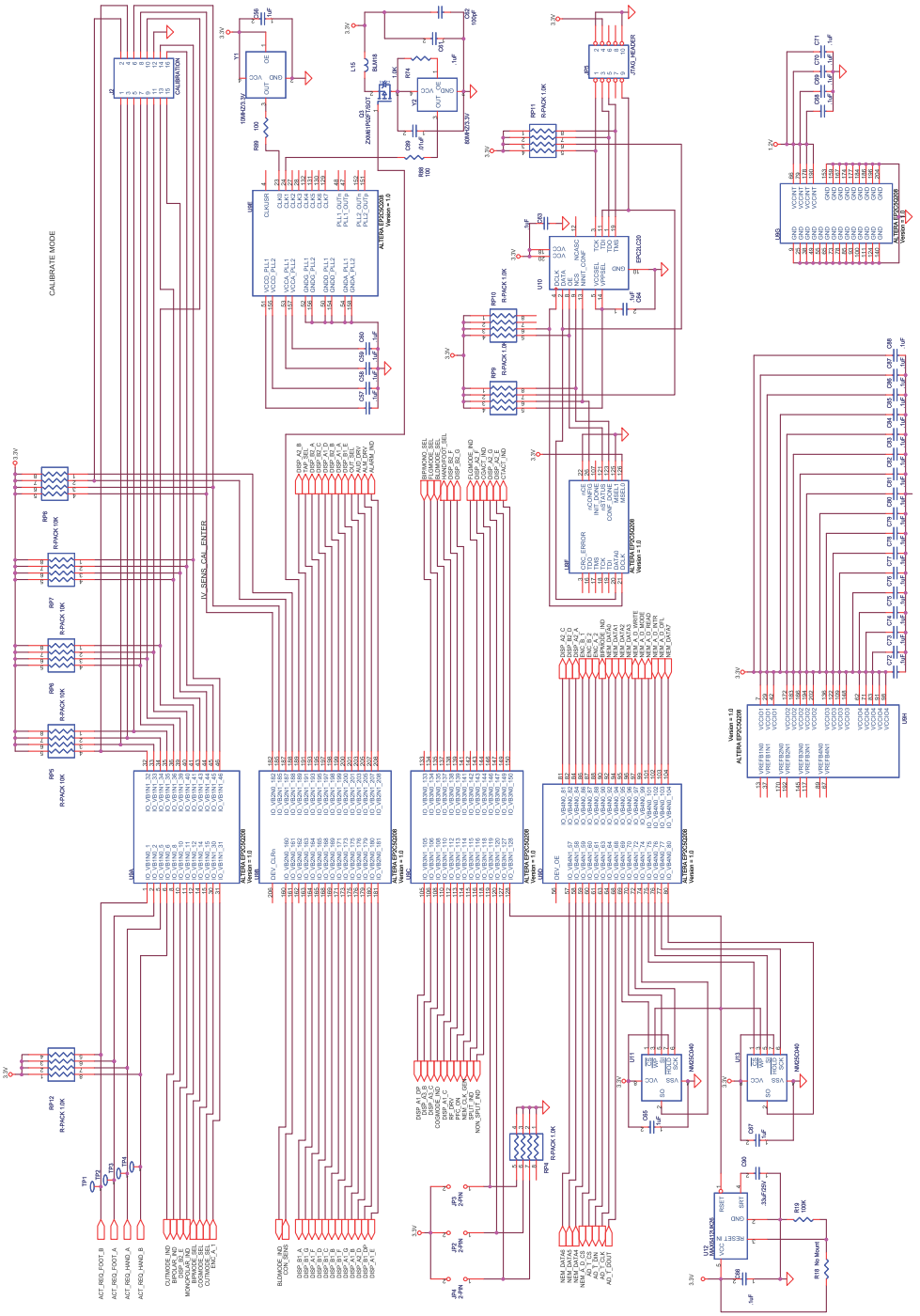
Display Board Diagnostic Circuit



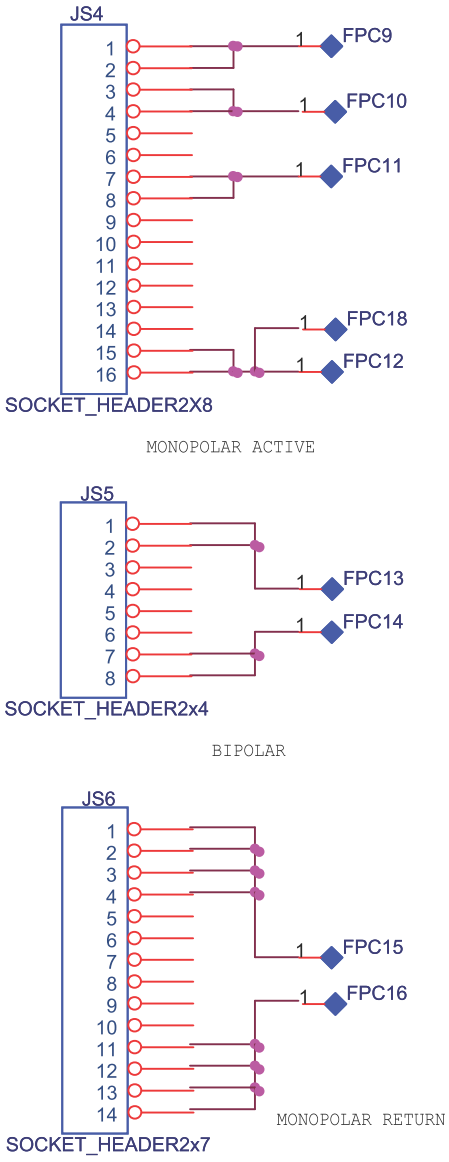
Display Board Neutral Electrode Monitoring Circuit



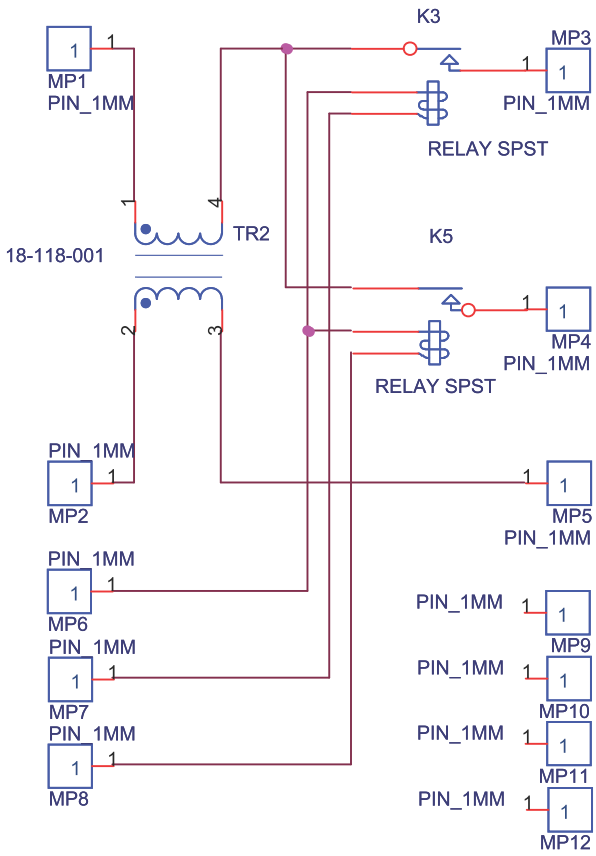
Display Board Control Logic Circuit



Connector Panel Block

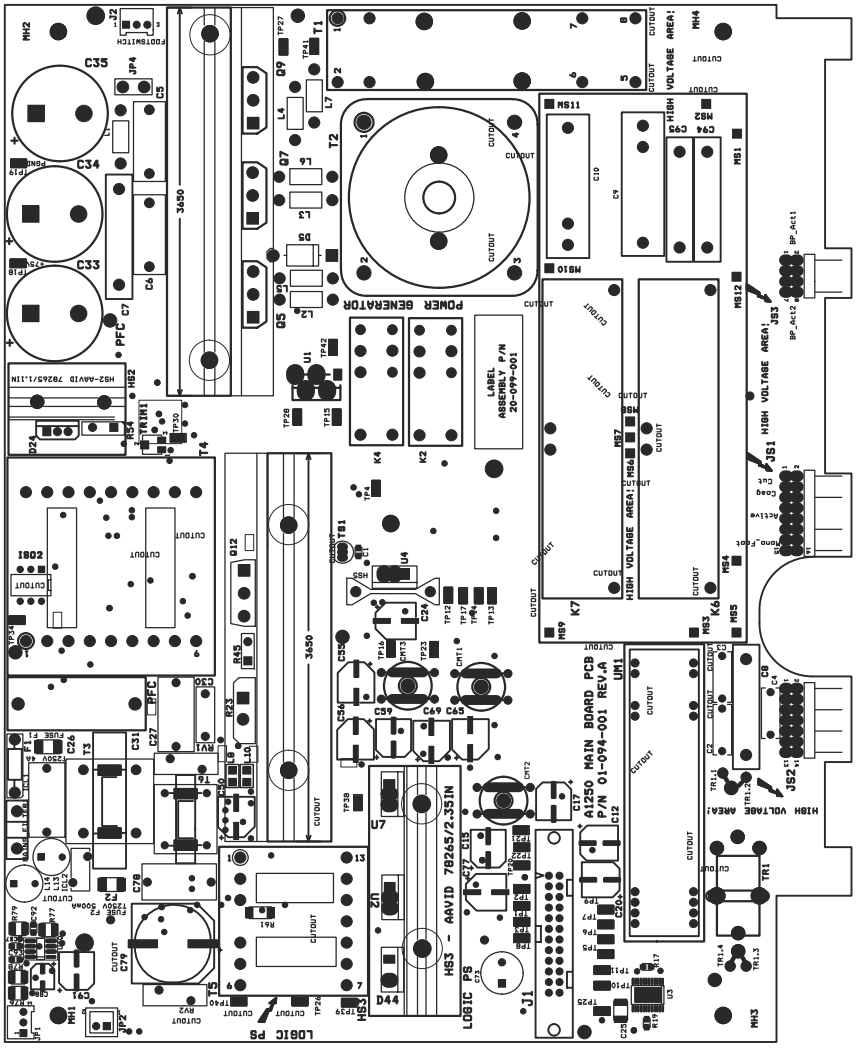


High Voltage Relay Circuit



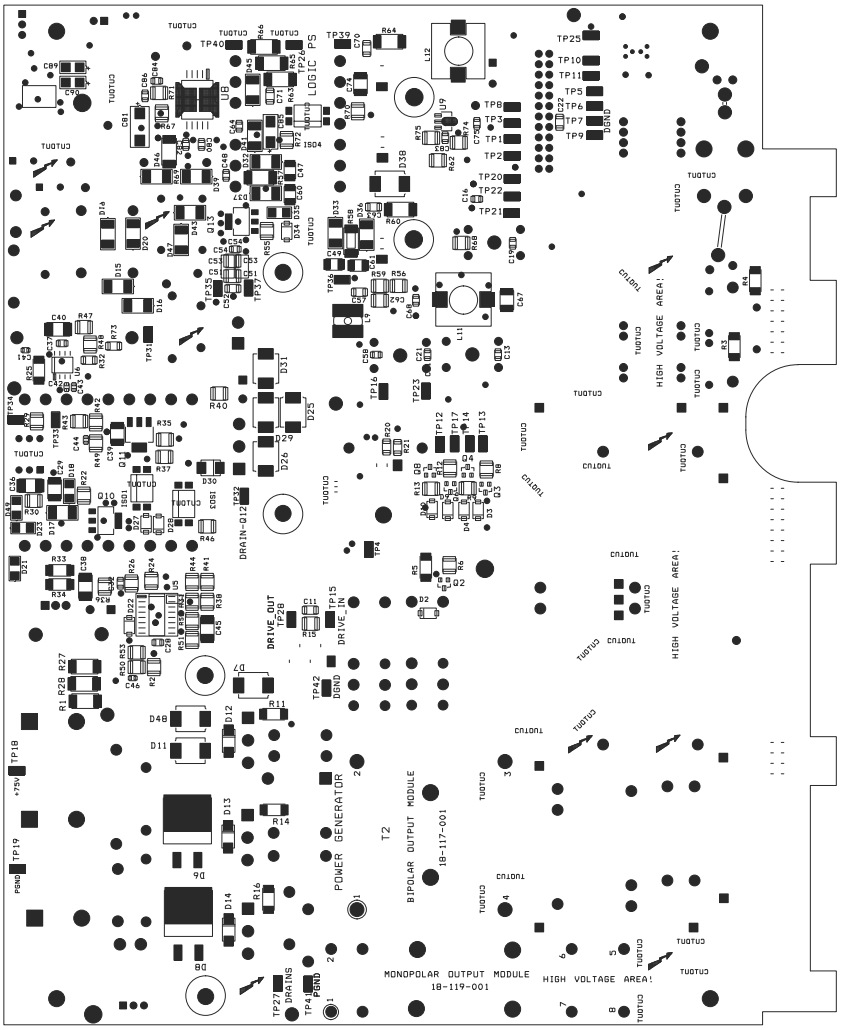
Printed Circuit Board 1 Main Board PCB Top View

Top View

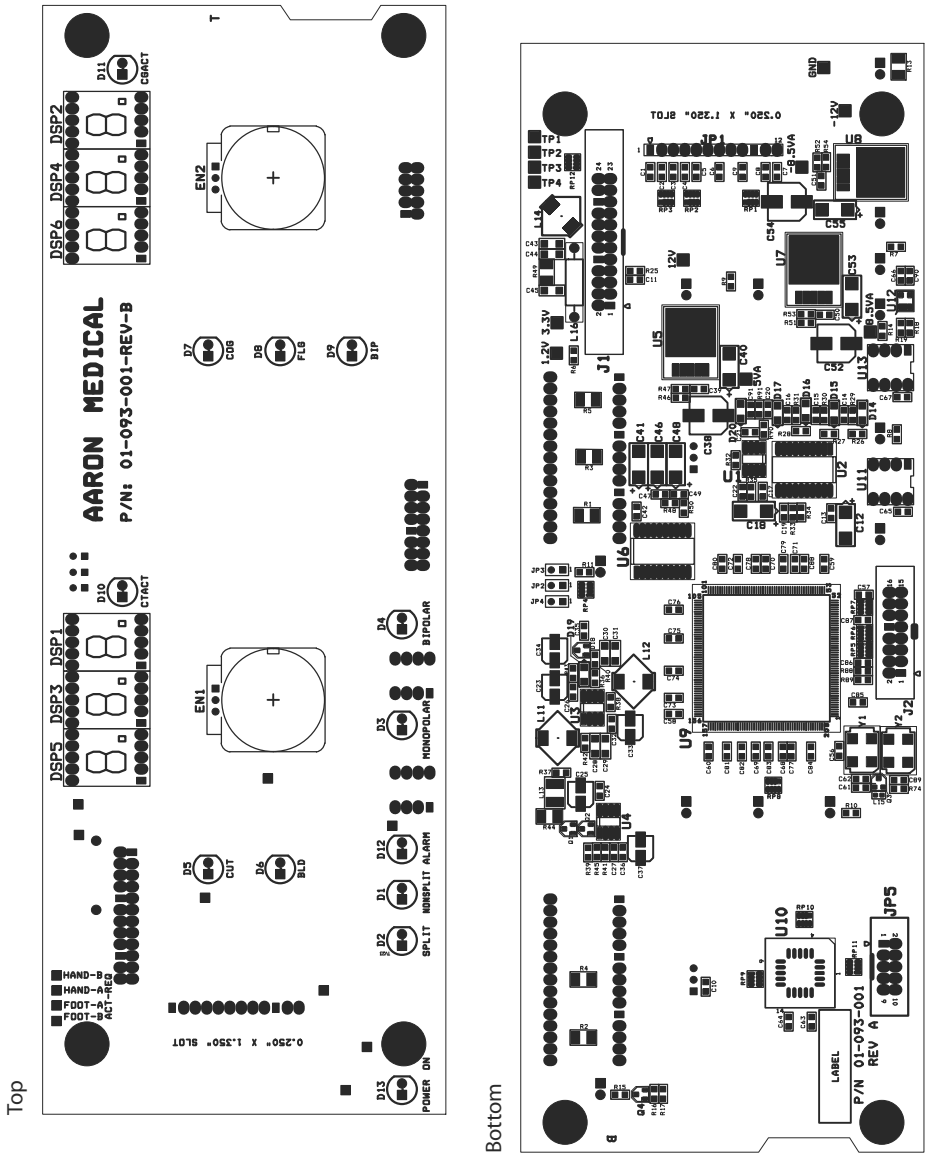


Printed Circuit Board 2 Main Board PCB Bottom View

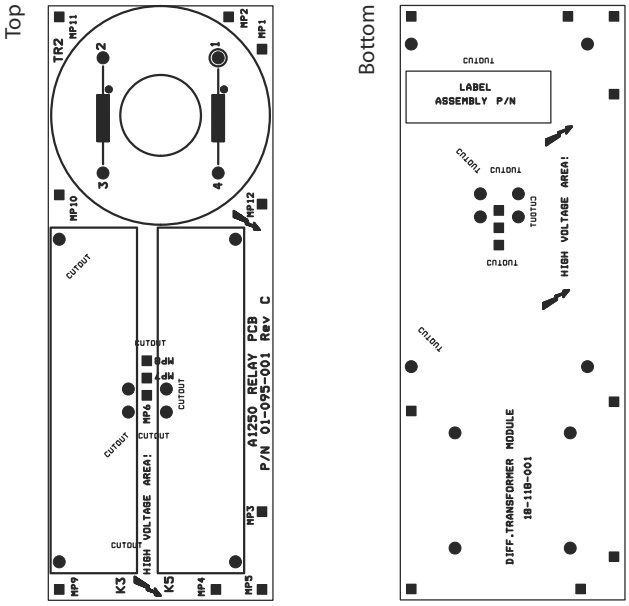
Bottom View



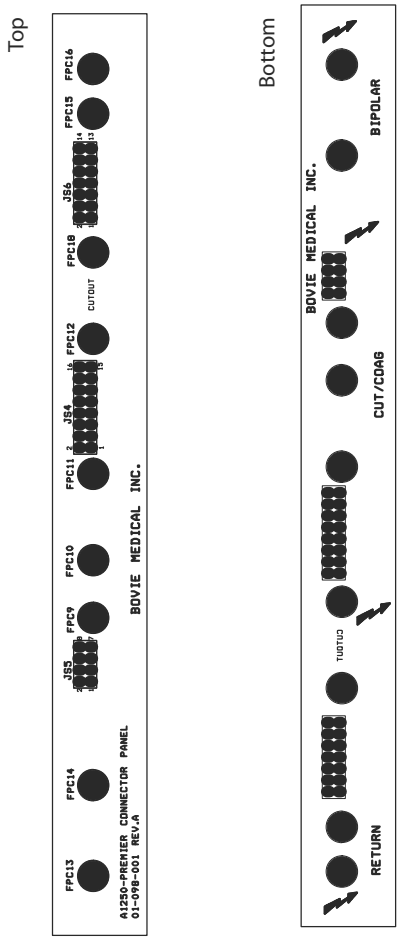
Printed Circuit Board 3 Display Board PCB (Top and Bottom View)



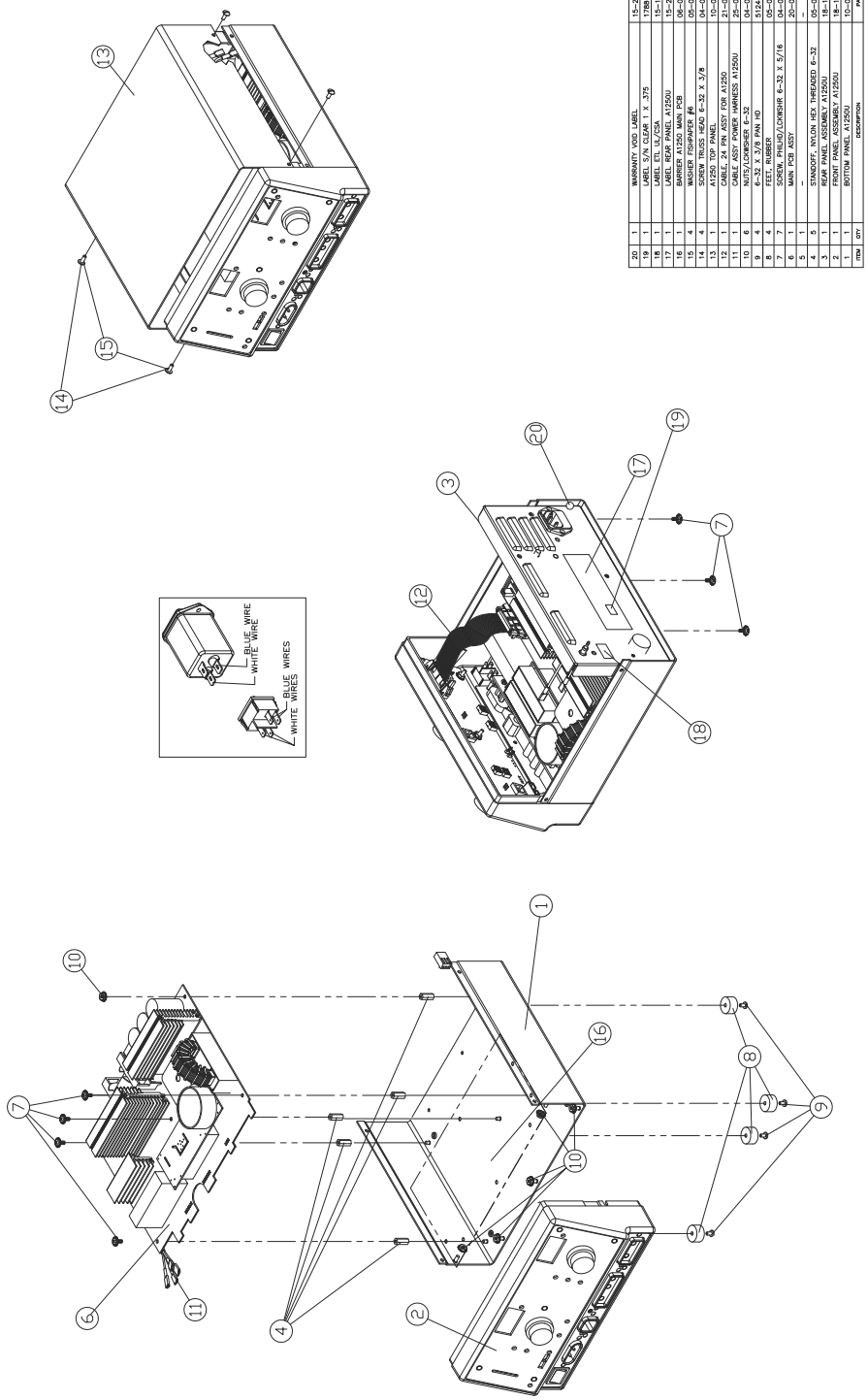
Printed Circuit Board 4 High Voltage Relay PCB (Top and Bottom Views)



Printed Circuit Board 5 Connector Panel PCB (Top and Bottom Views)

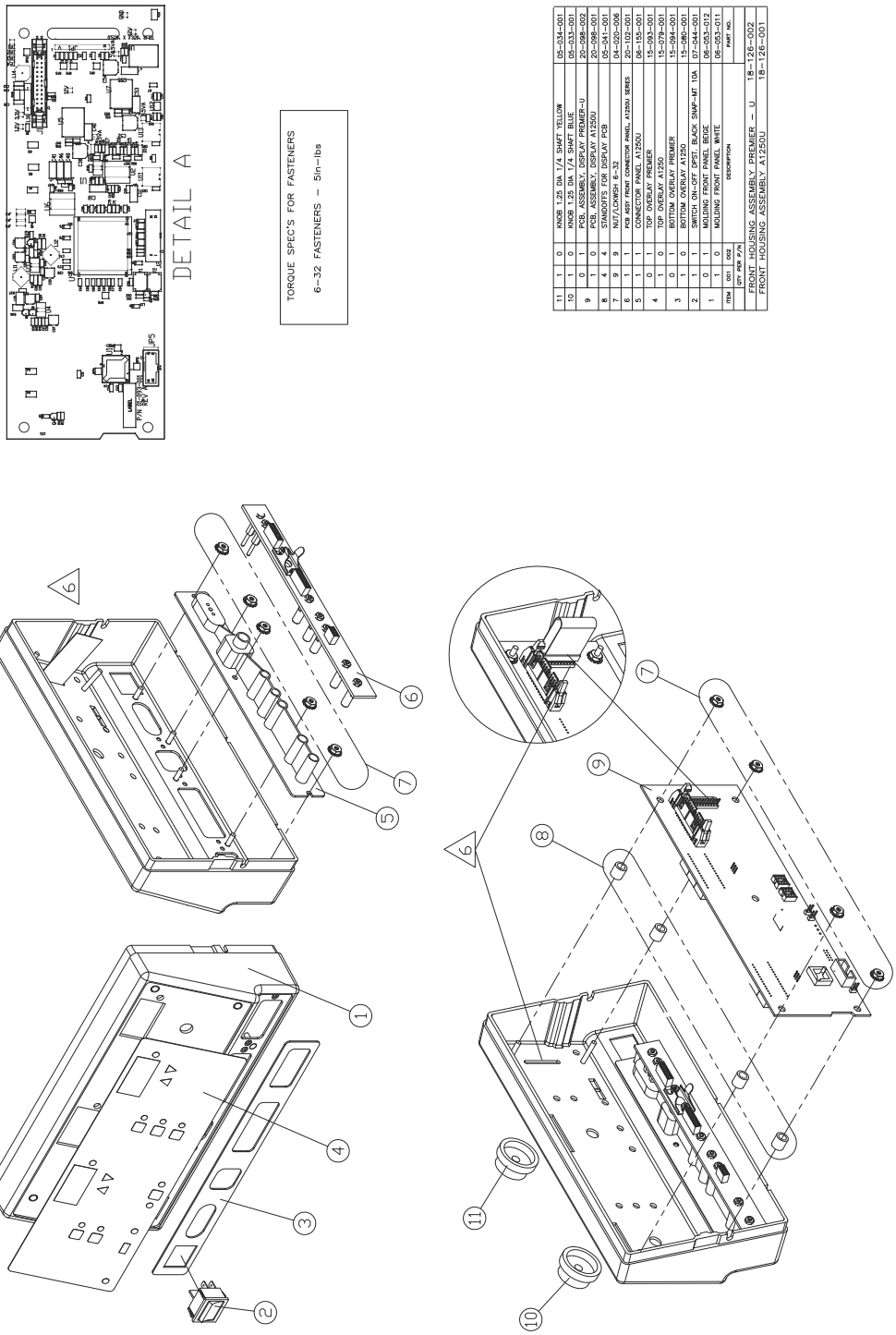


Assembly Drawing 1 SurgiStat Final Assembly

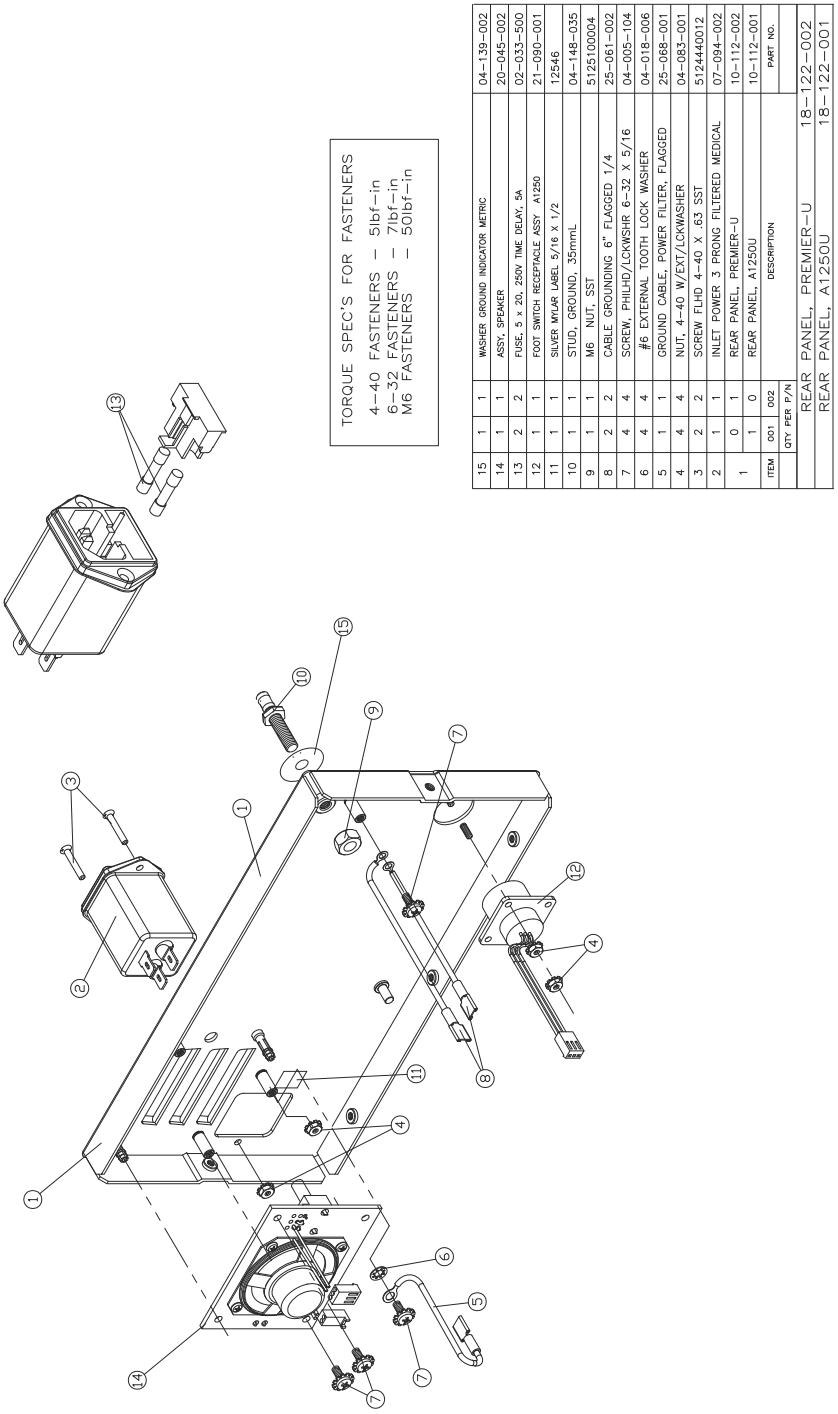


ITEM	QTY	DESCRIPTION	PART NO.
20	1	WARRANTY VOID LABEL	15-200-001
19	1	LABEL S/N CLEAR 1 X .375	17886
18	1	LABEL ETL UL/CSA	15-189-001
17	1	LABEL REAR PANEL A1250U	15-250-001
16	1	BARRIER A1250 MAIN PCB	06-270-001
15	4	WASHER FLAT #6	05-004-008
14	4	SCREW TRUSS HEAD #6-32 X 3/8	04-091-001
13	1	A1250 TOP PANEL	10-042-001
12	1	CABLE, 24 PIN ASSY FOR A1250	21-078-001
11	1	CABLE ASSY POWER HARNESS A1250U	25-090-001
10	6	NUTSY LOKWSHER 6-32	04-020-008
9	4	#6-32 X 1/4 PAN HD	01-040-004
8	4	FEET, RUBBER	05-039-001
7	7	SCREW, PHILHD/LOKWSHR #6-32 X 5/16	04-005-104
6	1	MAIN PCB ASSY	20-099-001
5	1	--	--
4	5	STANDOFF NYLON HEX THREADED 6-32	05-138-005
3	1	REAR PANEL ASSEMBLY A1250U	18-128-001
2	1	FRONT PANEL ASSEMBLY A1250U	18-126-001
1	1	BOTTOM PANEL A1250U	10-041-001

Assembly Drawing 2 SurgiStat Front Panel Assembly


DETAIL A
TORQUE SPEC'S FOR FASTENERS
6-32 FASTENERS - 5in-lbs
ITEM | QTY PER P/N | 001 | 002 | DESCRIPTION | PART NO.
FRONT HOUSING ASSEMBLY PREMIER - U 18-126-002
FRONT HOUSING ASSEMBLY A1250U 18-126-001
1 | 1 | 0 | MOLDING FRONT PANEL WHITE | 05-053-011
2 | 1 | 1 | SWITCH FRONT PANEL BEIGE | 07-044-001
3 | 1 | 0 | BOTTOM OVERLAY A1250 | 15-080-001
4 | 1 | 0 | TOP OVERLAY A1250 | 15-079-001
5 | 1 | 1 | CONNECTOR PANEL A1250U | 06-155-001
6 | 1 | 1 | PCB ASSY FRONT CONNECTOR PANEL A1250U SERIES | 20-102-001
7 | 9 | 9 | MACHINE SCREW 6-32 | 03-040-006
8 | 4 | 4 | STANDOFFS FOR DISPLAY PCB | 05-041-001
9 | 1 | 0 | PCB, ASSEMBLY, DISPLAY A1250U | 20-098-001
10 | 1 | 1 | PCB, ASSEMBLY, DISPLAY PREMIER-U | 20-098-002
11 | 1 | 0 | KNOB 1.25 DIA 1/4 SHAFT BLUE | 05-033-001
11 | 1 | 0 | KNOB 1.25 DIA 1/4 SHAFT YELLOW | 05-034-001

Assembly Drawing 3 SurgiStat Back Panel Assembly



ITEM	QTY PER P/N 001	002	DESCRIPTION	PART NO.
			REAR PANEL, PREMIER-U	18-122-002
			REAR PANEL, A1250U	18-122-001
1	1	0	REAR PANEL, A1250U	10-112-001
	0	1	REAR PANEL, PREMIER-U	10-112-002
2	1	1	INLET POWER 3 PRONG FILTERED MEDICAL	07-094-002
3	2	2	SCREW FLHD 4-40 X .63 SST	5124440012
4	4	4	NUT, 4-40 W/EXT/LCKWASHER	04-083-001
5	1	1	GROUND CABLE, POWER FILTER, FLAGGED	25-068-001
6	4	4	#6 EXTERNAL TOOTH LOCK WASHER	04-018-006
7	4	4	SCREW, PHILHD/LCKWSHR 6-32 X 5/16	04-005-104
8	2	2	CABLE GROUNDING 6" FLAGGED 1/4	25-061-002
9	1	1	M6 NUT, SST	5125100004
10	1	1	STUD, GROUND, 35mmL	04-148-035
11	1	1	SILVER MYLAR LABEL 5/16 X 1/2	12546
12	1	1	FOOT SWITCH RECEPTACLE ASSY A1250	21-090-001
13	2	2	FUSE, 5 x 20, 250V TIME DELAY, 5A	02-033-500
14	1	1	ASSY, SPEAKER	20-045-002
15	1	1	WASHER GROUND INDICATOR METRIC	04-139-002

Rx ONLY

ME20

0086

COVIDIEN

Part No. 1079008

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1-800-255-8522 [T]

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